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Indhold.

Det foreliggende 79. Bind af *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i København* danner Fortsættelsen af Bindene 73, 75 og 77 og indeholder udelukkende Afhandlinger baserede på Materiale indsamlet under Dr. Th. Mortensen's Pacific Expedition 1914—16 og Den danske Expedition til Kei-Øerne 1922.

Omkostningerne ved Publikationen af dette Bind er afholdt af et til dette Formål af Rask-Ørsted Fondet bevilget Beløb. For denne Bevilling ønsker jeg herved at bringe Direktionen for Rask-Ørsted Fondet min bedste Tak.

København, i Oktober 1925.

The present volume 79 of *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i København* forms the continuation of volumes 73, 75 and 77 and contains exclusively papers dealing with material collected during Dr. Th. Mortensen's Pacific Expedition 1914—16, and The Danish Expedition to the Kei Islands 1922.

The expenses of the publication of this volume are supplied by an amount granted for this purpose by the Rask-Oersted Fund. I beg herewith to express my best thanks to the Board of Directors of the Rask-Oersted Fund for this grant.

DR. TH. MORTENSEN.

Papers from Dr. Th. Mortensen's Pacific Expedition 1914—16.

XXV.

Planarians. Parts I—III.

By

Dr. **Sixten Bock**, Uppsala.

(With Plates I, II and IIa,)

The three parts of this paper were intended by the author to form three separate papers. For editorial reasons it has been necessary to let them appear as chapters only of one common paper. This explains that the three parts are not logically connected, a fact for which the author is not to be held responsible. For the same reasons the explanations of the plates and the lists of literature have been put together, at the end of the paper.

I.

Ceratoplana, a Polyclad genus living beneath Colobocentrotus, and a Synopsis of the ductus vaginalis in Polyclads.

(Plate I.)

The splendid collection of *Turbellaria* which my friend Dr. Th. Mortensen brought home from his Pacific-Expedition in 1914—16 has been sent to me for study, Among the material are several Polyclad-specimens, which, on account of the circumstances connected with their discovery, particularly caught Dr. Mortensen's attention. They were found underneath sea-urchins of the species *Colobocentrotus atratus* (L) at Hilo, Hawaii. During the expedition to the Kei Islands Dr. Mortensen also found on Krakatau a couple of Polyclad-specimens underneath the same species of sea-urchins. As these finds also in anatomical respect are of considerable interest, it is with particular pleasure that I carry out Dr. Mortensen's wish to give a special report on them.

Colobocentrotus lives in places that are particularly exposed to the action of the surf. From my own stay on the Bonin Islands, I have personal experience as to the ability of this sea-urchin to withstand even very strong breakers without being torn away. Such localities are, however, hardly suitable for a sensitive Polyclad-fauna. Under such circumstances, the finding of the Polyclads underneath *Colobocentrotus* can hardly be a matter of chance, especially as altogether no less than six specimens were collected together with this sea-urchin, and two so widely separated localities are concerned as Hawaii and Krakatau in the Sunda Strait. In Dr. Mortensen's large collection of Polyclads from the Pacific and the Malayan archipelago there is no other representative of this new genus.

This Polyclad can at the most be considered an „epök", taken in the meaning that Cramer has given the term, or possibly as a commensal, and is thus no true parasite. *Ceratoplana* seeks first of all protection underneath *Colobocentrotus*, which cannot be easily moved by the breakers. It probably also shares the meal with its „host", snatching the food-remnants.

The Commensalism of Polyclads.

Any absolutely certain cases of pure parasitism among Polyclads are to this date unknown. The Polyclads that have been found on other animals, must be considered either as „epöks" or as commensals, unless they are robbers attacking the soft parts of their „hosts". In regard to the finds, when only a single specimen has been detected on an Echinoderm, in a shell, or in an Ascidian, it appears safer to consider them with Lang (1884, p. 559, regarding *Prostheceraeus Giesbrechti*) as temporary guests until similar finds have been repeated. With this reservation I shall give a report on the Polyclads that have been found associated with other Evertebrates. However, I shall entirely pass by such cases as, for instance, *Stylochus*-species and *Discoplana subviridis* (Plehn), that live among branches of living Madreporarians (observed by me on the islands of Bonin and Gilbert in the Pacific), *Notoplana atomata* (O. F. Müll) and *Leptoplana tremellaris* (O. F. Müll), that occur in masses on *Mytilus*-colonies (on the west coast of Scandinavia), *Prostheceraeus vittatus* (Montagu) and *Stylostomum ellipse* (Dalyell) on *Ciona intestinalis*-colonies, and *Stylochus* on young oyster-colonies,

where it appears as a voracious destroyer (observations in the latter case made in Japan). These examples from my own experience are, however, by no means confined to the aforementioned manner of occurrence; they live also among seaweed, under stones, etc.

v. Graff in his paper on „Die Turbellarien als Parasiten und Wirte" (Graz, 1903) has brought together the information at hand concerning Polyclads found on other animals. Of the enumerated numbers 39 - 47, concerning Polyclads (l. c., pp. 38 - 40), the following species are undoubtedly identifiable Polyclads (the names in parenthesis are used by v. Graff): *Stylochus zebra* (Verrill), in shells inhabited by Hermit Crabs; *Hoploplana* („*Planocera*") *inquilina* (Wheeler) in the mollusc *Sycotypus canaliculatus* Gill; *Hoploplana* („*Planocera*") *insignis* (Lang), one specimen collected in the branchial cavity of *Murex brandaris* L. (but another specimen found free living); *Prostheceraeus Giesbrechti* Lang, the only specimen in *Ciona intestinalis* (L), and *Cycloporus papillosus* Lang („*Planaria schlosseri* Girard") on *Botryllus schlosseri* var. *adonis* Girard (cfr. Francotte 1898). „*Planaria*" *velellae* Lesson is possibly, according to v. Graff (1892 pag. 11) identical with *Planocera pellucida* (Mertens), found while consuming the soft parts of Velella.

The remaining „*Typhlolepta acuta* Girard", which in large numbers crawl on *Chiridota laevis*, „*Typhlocolax acuminatus* Stimpson„ „in freto Behringi, parasiticus in Chiridotae specie" and „*Cryptocoelum opacum* Stimpson" „in echinarachnio magno" cannot be placed even as to the family, and it is, after all, very doubtful whether they are Polyclads. The first mentioned is later on spoken of by Verrill, who supposes it to be an Acoel or Rhabdocoel. v. Graff fails to mention, probably on purpose, *Planocera simrothi* v. Graff 1892. The only specimen found in Janthina (in an empty shell?).

Crozier describes in 1917 a *Pseudoceros sp.* „found in association with various tunicates, upon the surface of which it has been seen to feed". Three colour „varieties", each on a different ascidian; the pigmentation due to the food.

From Panama Dr. Mortensen has brought numerous specimens of an *Emprosthopharynx* and a few specimens of *Euphrosthiostomum adherens* n. g. n. sp., both found in shells of the Pagurid *Petrochirus californiensis* Boucrez in two different localities. In Japan I found on a sea-urchin, *Clypeaster*, a new species of *Neo-*

stylochus, which I intend to call *N. viridis.* In Fiji I have collected a large number of specimens belonging to a representative of a new acotylean family, and this interesting Polyclad is a typical inhabitant of Melitodes. The two last mentioned, as well as Crozier's *Pseudoceros* sp., show a great resemblance in colour to that of their „hosts". According to Francotte (1898), this is also the case with *Cycloporus papillosus* when found on synascidians; a statement that I can corroborate from observations in Scandinavia. In these cases the pigment originates from the tissues of the „hosts". It might be mentioned in this connection that *Eurylepta cornuta* var. *melobesiarum* Lang (1884 p. 578) and *Cycloporus papillosus* var. *laevigatus* Lang, found on Lithothamnions (Bock, 1913, p. 264), also show a splendid likeness to the substratum.

The following species are intimately associated with their hosts and may thus be considered commensals (sensu lato): *Stylochus zebra*, *Emprosthopharynx opisthoporus*, *Euprosthiostomum adhaerens* (all three with Pagurids), *Hoploplana inquilina* in Sycotypus. *Ceratoplana* is a less advanced member of this group.

Ceratoplana colobocentroti n. g. n. sp.

(Plate, Fig. 1)

Locality: Sunda Strait, Krakatau, underneath *Colobocentrotus atratus* (L.).

Material: Two specimens collected in January, 1922.

The two specimens of uniform size measured in length 7 mm, and in breadth 3 mm.

The shape of the body is shown on Plate I, Fig. 1. It is a shape that often occurs in the genus *Stylochoplana*, and the presence of well-developed tentacles induced me, therefore, to refer this species provisionally, before the series of sections were obtained, to this genus. The body, which is thin, as in most *Leptoplanidae*, becomes widest in front of the tentacles. In the region of the pharynx the margins of the body are nearly parallel. The postpharyngeal part of the body is short and quickly tapering (text-fig. 1).

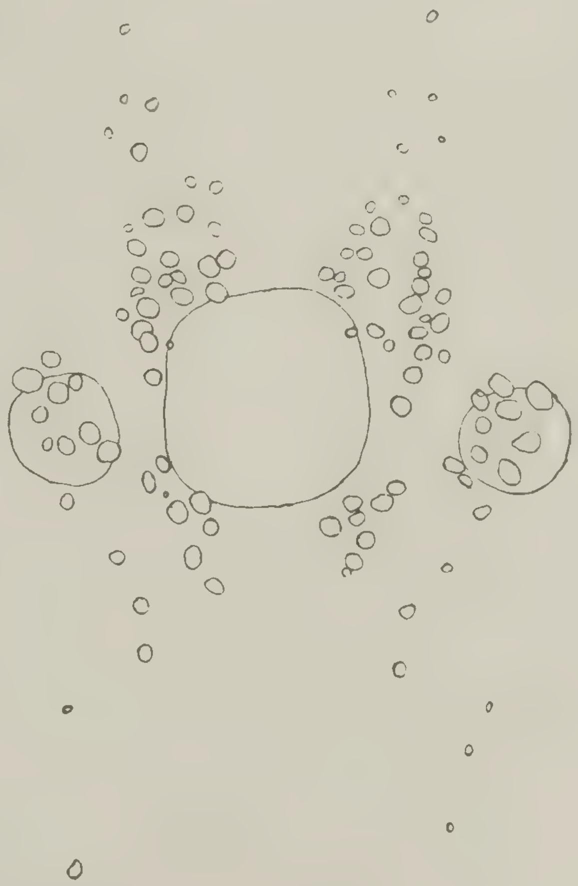
The tentacles are situated near the limit of the first quarter of the body. The rounded shape, which Plate I, Fig. 1 shows, is the result of a very decided contraction during the preservation, as shown very clearly in the series of sections of the animal. In living specimens their real shape is likely to be elongated, narrow and

Text-fig. 1. *Ceratoplana colobocentroti* n. g. n. sp. Ventral view of animal. Tentacles not visible.

pointed at the top, thus showing likeness to the tentacles, which one may see in European species of *Stylochoplana* (for example, Lang, 1884, Taf. 2). Plate I, Fig. 2 furnishes a better picture of the tentacles than Fig. 1 and comes closer to the natural shape; on Plate I, Fig. 5 the tentacles are more contracted. The two figures mentioned last belong to var. *hawaiiensis.* The distance between the two tentacles is about $^1/_5$ and $^1/_6$ of the greatest breadth of the body. A line connecting the two would run across the broad, rounded brain.

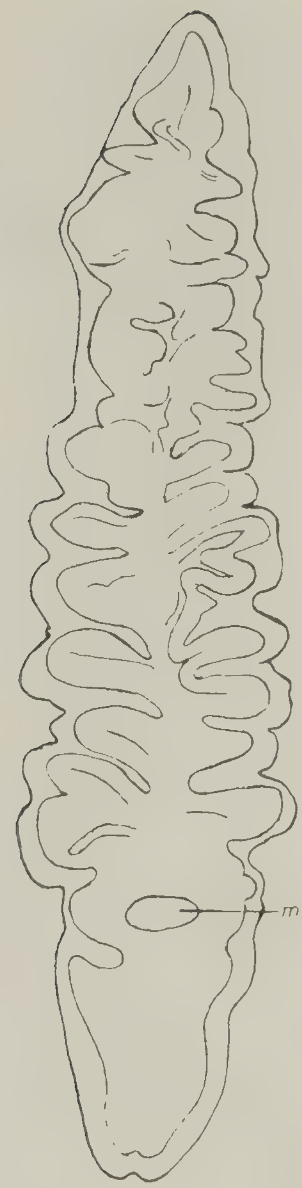
The dorsal surface of the body has a characteristic colour pattern (Plate I, Fig. 1), caused by numerous small, irregular, greenish-brown pigment-spots. They are particularly frequent in the middle zone of the body. The pigment occurs in an unusual quantity in the dorsal muscular wall of the body, but is also found, although more sparsely, in the dorsal part of the parenchyma. Epidermis and basement membrane entirely lack pigmentation.

The arrangement of the eyes is shown in text-fig. 2. A characteristic feature noted in each of the cerebral eye-clusters is a denser anterior cluster of ocelli and a separate posterior group behind the brain. Still further back toward the pharynx a few scattered ocelli occur. In this connection it might be mentioned that the two types of eyes, which I have found in several *Stylochoplana*-species, and which I shall describe in a special paper, also occur in these cerebral eye-clusters. As regards the tentacular eye-groups, the majority of the ocelli are situated inside the tentacles.



Text-fig. 2. *Ceratoplana colobocentroti.* Arrangement of cerebral and tentacular eyes.

The pharynx is almost centrally placed, long and narrow, and much folded (text-fig. 3). This figure also shows that the mouth is far back in the pharyngeal



Text-fig. 3. *Ceratoplana colobocentroti.* Outline drawing of pharynx and pharyngeal pocket. 28 x.

pocket and that this presents only shallow diverticula. The mouth is just in front of the last third of the body.

The male and female apertures are very close to each other (text-fig. 6), and the distance to the mouth is a little less than that to the caudal end of the body.

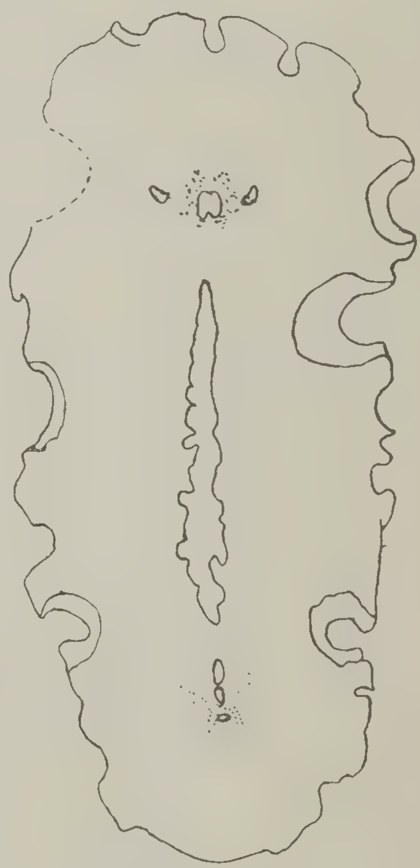
The organization of the genital apparatus, on which the raising of the species to generic rank is warranted, will be treated in a special chapter. At present it is only necessary to mention that the ductus vaginalis is of the same length as the vagina (text-fig. 6).

Ceratoplana colobocentroti var. **hawaiiensis** n. var.

Locality: Hilo, Hawaii, underneath *Colobocentrotus atratus* (L.).

Material: Four specimens collected by Dr. Th. Mortensen April 15, 1914.

The specimens from Hawaii agree to a great extent with *C. colobocentroti* from Krakatau as to the general bodily structure; yet they differ in some respects (text-fig. 4).



Text-fig. 4. *Ceratoplana colobocentroti* var. *hawaiiensis* n. var.

The alcoholic specimens do not show any sign of pattern or colour on the dorsal side (Plate I, Fig. 2, 4 and 8). However, as only preserved material is at hand, and no information as to the colour of the living animals is to be found, one should perhaps not attach too much importance to this dissimilarity to the Krakatau-specimens. The sections verify, nevertheless, the total absence of pigment in the muscular wall of the body that gives *colobocentroti* its characteristic appearance. On the other hand, sparse clusterings of pigment in the parenchyma are distinguishable in the sections, as in *colobocentroti*, but this pigmentation is on preserved animals invisible from the outside.

The eye-clusters (text-fig. 5) show a greater

number of ocelli. The larger size of the body may play a part in this condition. The brain is clearly bi-lobed (text-fig. 5, and Plate I, Fig. 7), while in *C. colobocentroti* it is nearly rounded.

The pharynx is relatively longer and narrower (Plate I, Fig. 9), and the mouth even further back (compare Plate I, Fig. 6, where the pharynx is partly protruded through the mouth) than in the Krakatau-specimens. The postoral part of the pharyngeal pocket constitutes only $^1/_{10}$ of its total length. The male genital apparatus is set far apart from the pharyngeal pocket (text-fig. 4), contrary to that in *colobocentroti*. The hinder commissure of the seminal canals is further away from the female gonopore (text-fig. 7).

Text-fig. 5.
Ceratoplana colobocentroti var. *hawaiiensis*.
Arrangement of cerebral and tentacular eyes. 45 x, ph. pharynx; i, anterior unpaired intestinal diverticulum.

However, we find the real difference in the female genital apparatus. All the Hawaiian specimens agree in the ductus vaginalis being considerably lengthened and possessing a long loop frontwards in direction towards the male organ (text-fig. 7).

The descriptions given above doubtlessly show that it is not unwarranted to regard the *Ceratoplana*-specimens from Hawaii as at least a special variety, as long as transitory forms are unknown. Hence, the reason I am letting the *Ceratoplana*-specimens from the Sunda Straits represent the species is based on the fact that I consider the elongation of the ductus vaginalis as a secondarily acquired feature.

The three least contracted specimens from Hawaii are reproduced in fig. 2—9 on the Plate. The largest specimen measures 14 mm. in total length and 6 mm. in breadth, in the pharyngeal zone.

The anatomical structure of Ceratoplana.

It will suffice here to treat more thoroughly only the structures of the genital organs, as in its general organization this Polyclad genus resembles that of the genus *Stylochoplana*. A few features, however, deserve to be described. The description below refers, unless specified to the contrary, to *C. colobocentroti*.

Body-wall: The ventral epithelium near the margin is considerably thickened with numerous glandular cells containing a granular, eosinophile secretion. As I have mentioned before on various occasions, this secretion is of importance in aiding the animal in adhering to the substratum. It is, therefore, to be expected that this peripheral glandular field should be well-developed in a species found in localities exposed to the strong action of the surf. The musculature of the body-wall is unusually thick and, for a Leptoplanid, of almost enormous strength. In the lateral parts of the body, the dorsal and ventral muscularis takes up nearly $^2/_3$ of the space inside the basement membrane. The inner longitudinal muscular layer on the ventral side is, of course, the most powerful. But underneath the pharyngeal pocket it becomes so much thinner that the inner transversal muscular layer of the body-wall is a great deal thicker than it. It should also be mentioned that on the dorsal side the transversal muscle fibres, arranged in a single row and lying immediately below the basement membrane, are unusually thick. The dorso-ventral muscular bundles are so strongly developed that the parenchyma becomes insignificant. This prominent feature is, of course, also due to the great quantity of intestinal-branches, genital glands, and embedded glandular cells and the thickness of the ventral net-work of nerves. The unusual strength of the muscles must, of course, be connected with the occurrence of the animals near or in breakers. The whole body assumes the character of a single large adhesive disc, and the above-mentioned submarginal glandular layer confirms this impression. The whole body is thus well adapted for attachment to the substratum.

Digestive system: The mouth is located near the hinder edge of the pharyngeal pocket. As a result of the splendid development

of the muscular wall of the body, the entrance to the pocket becomes quite long without causing a ridge to appear in the pharyngeal cavity.

The pharynx has numerous thick and very muscular folds, and its structure seems to indicate that it can be protruded to a great length. It is apparently adapted for a more efficient gathering of the food. The organization of the main gut clearly shows that only smaller organisms or small food-parts can enter the internal mouth, which is situated near the frontal end of the pharyngeal pocket. The main gut is only a very slender tube, which in diameter is hardly more than $^1/_{10}$ of the width of the pharyngeal pocket. In spite of the great length of the main gut, only a few roots of intestinal caeca branch off, having at their bases a very small diameter. Two pairs occur in the region of the mouth, and one further pair is close to the interior mouth. Numerous but very insignificant lateral projections of the main gut, however, exist. The more peripheral canal-system becomes, nevertheless, quite extensive. Minot's granular cells („Körner-kolben") are numerous in the main gut, but only a few are found in the gut-diverticula. The secretion corpuscles, which are decidedly eosinophile, are of uniform and very small size.

Genital organs.

The testes are very numerous and are densely clustered. Although they are situated on the ventral side, they almost reach the mid-region, and hence project in between the intestinal branches. This deviation from the normal in Polyclads is not only due to the above-mentioned thickness of the ventral muscular wall, but also to the fact that the ventral net-work of nerves above the ventral muscular layers becomes so well-developed that the larger nerve-trunks compete in size with the thick inner longitudinal muscular layer.

The ovaries are less numerous than the testes. They are oval in shape, and, extending in a dorso-ventral direction, project in between the intestinal caeca. This is especially apparent in the case of the larger and more mature ovaries. The smaller ovaries, in which the oocytes are still insignificant, lie in the dorsal half of the body, close to the inner side of the muscular body-wall, while the larger

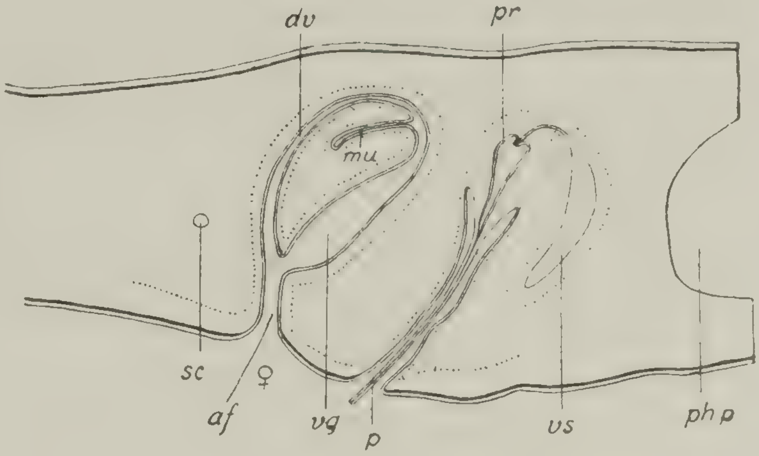
ovaries, which contain up to 100 μ large oocytes, full of yolk-matter, are also located toward the center of the pharenchyma. Being so close to the intestinal branches, the ventral parts of these ovaries, which contain the largest oocytes, have the best location for nourishment. The reason for the fact that all the larger oocytes are, without exception, located in the ventral part of the ovary, is of course, its proximity to the intestinal caeca, which constitute the source of nutritive supply. Thus, in the ovary of *Ceratoplana*, the germinative zone is always dorsally situated, and, consequently, always in the zone above the intestinal caeca.

The above statements show that, in principle, the grouping of the genital glands in *Ceratoplana* is the usual one occurring in Polyclads; i. e., the ovaries lie dorsally, the testes ventrally. The large increase in the size of the ovaries during maturity, and the growing toward the center of the body, has as a result not only that both kinds of genital glands reach one another, but also that the ovaries, increasing in size, finally protrude downwards in between the testes. The foundation for a further intermixture of ovaries and testes seems thus to be established.

Male genital apparatus. The seminal capillaries are of a very fine calibre. The two large seminal canals communicate with each other just in back of the female apparatus (text-fig. 6, sc.). In *hawaiiensis* the communicating seminal canal occurs more posteriorwards (text-fig. 7 sc.). Slightly coiling dorso-ventrally, the seminal canals continue frontwards toward the region of the mouth, which they slightly pass by. Coiling more and more, and increasing in width, they turn off in a caudal direction and later on run closer to the median-line of the animal. Near the male copulatory organ the two canals become narrower, and, turning toward the median-line, soon join each other as a short duct, vas deferens impar, before entering the seminal vecicle.

The vesicula seminalis (text-fig. 6 vs.) is oblong and has a dorso-ventral position. Both in size, as well as in the strength and arrangement of the musculature, it shows similarity to that of the genus *Stylochoplana*. The vas deferens opens into the caudo-ventral end of the vesicle. The vesicula seminalis tapers into an efferent duct with well-developed muscular wall at its upper or distal end, and continues as such to the prostate vesicle, which it enters.

The prostate vesicle (pr) is oval and has a stronger muscular wall than the vesicula seminalis. The muscularis is pierced by numerous ducts leading from the extracapsular gland cells. These empty their secretion into the lumen of the prostatic vesicle. The epithelial lining of this vesicle is also secretory. The large-granular quality of the secretion from the prostatic gland cells is noteworthy. In its reaction to eosine it is absolutely normal, and thus stains faintly. The epithelial lining of the prostate vesicle, which contains one-third of the thickness of the muscular wall, has in addition numerous ciliated cells. The long cilia reach to the center of the lumen of the vesicle, and thus exceed the height of the epithelial cells.



Text-fig. 6. *Ceratoplana colobocentroti.* Longitudinal section through genital apparatus. 66 x, af, antrum feminum; dv, ductus vaginalis; mu, median uterine duct; p, penis; php, pharyngeal pocket; pr, prostatic vesicle; sc, seminal canal; vg, vagina; vs. vesicula seminalis.

Such a thick lining of cilia in the prostatic vesicle, particularly when its secretory system has reached its full development, as is the case here, is very unusual in Polyclads. On the other hand, before the secretory cells are ready, a dense lining of cilia belongs to the epithelial cells. This condition has been treated by me in an earlier paper (Bock, 1924, p. 15). The cilia can hardly be supposed to aid in the ejaculation of the fluid, for the thick muscular walls of the vesicle are no doubt quite sufficient for this purpose. Therefore, I believe the purpose of the cilia is to clean up, to produce a water-stream needed for the respiration of the tissues, and to distribute the secretion in the lumen of the vesicle. The muscular duct that leads from the vesicula seminalis does not only pierce the wall of the prostate vesicle, but also projects slightly into the lumen as a short thick protuberance. There is, however, no division into chambers in this prostate vesicle, as in the case of that of *Notoplana* and *Copidoplana*, but the cavity of the vesicle encircles the protuberance completely. It should be noted that on its outer side, that is, the one toward the prostatic lumen, the protuberance is covered by an ordinary epithelium without any

glandular cells. The various features mentioned show that in its type the prostate vesicle here more closely resembles that of *Stylochoplana* than that of *Notoplana*, but also that a tendency towards differentiation in direction of the conditions existing in *Notoplana* can be traced.

I may at this point be allowed a deviation from the general description. A noteworthy feature is that no sperms are ever found in the prostate vesicle of Polyclads. In the numerous cases, when the prostate vesicle is separate (see Bock, 1913, p. 39) (for instance, in *Stylochidae*) and the ductus ejaculatorius, therefore, opens into the efferent duct of the prostate vesicle, this is hardly to be expected, although there might be a possibility of suction of sperms back into the vesicle when this expands after contraction. This absence of spermatozoa is, however, more marked when they must pass through the prostate vesicle during the ejaculation. This is generally the case in *Leptoplanidae*. In *Stylochoplana* the efferent duct of the vesicula seminalis opens directly into the proximal end of the prostate vesicle, and thus the mass of spermatozoa passes along the entire length of the prostatic lumen. As an example I can point to *Stylochoplana maculata* (Quatrefages), the copulatory apparatus of which is shown in text-fig. 32 (p. 176) in my thesis of 1913. However, among the great numbers of Polyclads that I have examined, I have never run across a single case that contained any spermatozoa in the prostate vesicle; consequently, not even when the vesicula seminalis empties directly into the prostate vesicle, and both lie close to each other.

In the family *Leptoplanidae* the development of the prostate vesicle is such that the mass of spermatozoa passes through the vesicle without mixing with the prostatic secretion. In the genus *Notoplana* (see Bock, 1913) the efferent duct of the vesicula seminalis traverses the greater part of the lumen of the prostate vesicle and finally empties at its distal end. In more extreme cases (see, for instance, *Notoplana stilifera*, Bock 1923 c, text-fig. 7, p. 352), the epithelial wall in this part of the vesicle is not secretory. The glandular cells of the prostate are in these cases limited to the chambers which lie around the distal end of the efferent duct of the vesicula seminalis. Such an arrangement of chambers is advantageous, not only because the secretory epithelium

increases to a considerable extent, but also because the sperms during their passage through the prostate vesicle do not need to become mixed with the glandular secretion. In this connection it should be mentioned, that in its entire length, thus also the part inside the prostate vesicle, this efferent duct from the vesicula seminalis has a well-developed muscular wall. Therefore, any active participation on the part of the prostate vesicle in the ejaculation of the sperma is not necessarily needed. From the distal glandless end of the prostate vesicle runs the efferent duct as a shaft-like continuation through the unusnally elongated narrow penis.

We now return to the prostate vesicle of *Ceratoplana*. The efferent duct is much longer than the prostate vesicle. The muscular covering of the duct is not sharply divided from the muscularis of the prostate, which gradually fuses with the muscles of the duct, in that the muscle fibres by degrees become grouped in rings around the epithelial wall of the duct. The epithelial tube begins as a small funnel-shaped projection, pierces the muscular wall of the prostate vesicle, and continues through the basal part of the penis, surrounded by a thick circular muscle layer, traversing this organ throughout its entire length; in the meantime the muscle layer of the duct gradually diminishes in thickness.

The penis is unarmed. It is unusually long, and this becomes more apparent as its diameter is very small (text-fig. 6 and 7). At its base the penis is 60 μ in diameter, while it gradually tapers towards its apex, where its diameter reaches a maximum of only 8 μ. In the interior this organ consists of the duct that comes from the prostate vesicle. The tissue surrounding it is very feebly developed. The muscular sheath of this duct ends, however, at about $^2/_3$ of the distance from the base of the penis to its apex. The epithelial lining from the base of the penis to its apex is so low that sometimes it can hardly be discerned, and the absolutely flattened epithelial nuclei are so sparse, that at times they are almost indistinguishable. Thus the epithelial lining of the penis is very different from the epithelium in the antrum masculinum described below. Beneath the epithelium of the penis lies a well-developed circular muscle layer with densely arranged fibres. It can be traced all the way to the apex. Between this circular muscle layer and that of the ductus ejaculatorius is a thin parenchyma

layer traversed by thick longitudinal muscle fibres. In this region are found the numerous nuclei belonging to both circular muscle layers, while the layers themselves are entirely free from nuclei.

The thickness and firmness of the musculature must account for the rigidity of this flexible penis. In one specimen of *hawaiiensis* it is rolled up in a distal coil.

Antrum masculinum has a tubular shape and runs almost dorso-ventrally with a slight backward direction, which shows that the characteristic of *Leptoplanidae*, i. e. the orientation of the copulatory organ in a rostro-caudal direction, has not entirely disappeared.

The penis almost completely fills the tube-like antrum, and there exists no special penis-sheath (text-fig. 6 and 7). The antrum, however, can be said to be divided into two parts through the histological structure of the epithelium in the upper and the lower parts. The latter shows great likenes to the epidermis immediately around the male aperture. Glandular cells are thus absent here, and the differentiation consists primarily in the epithelium being less thick. On the other hand, the intensive eosine stain in the outer zone of the epithelial cells belonging to the upper part of the antrum shows that here the epithelium has acquired a special functional adaptation. This outer zone of the epithelium, i. e. the region outside the nuclei, is packed with tiny granulae that are stained deeply red with eosine. The drops are only about $^1/_4$ or $^1/_5$ the size of the shell-secretion elements. The accumulation of the granulae in a peripheral zone only gives the cells quite a dissimilarity to the typical glandular cells, and the fact that these cells have well-developed cilia strengthens this impression. I have no reasons either to assume that this cell-content is emptied. It does not seem probable to me that these bodies, which are eosinophile, should have the purpose of keeping the penis lubricated. In such a case it would not be likely that this occurrence of cells would be limited only to the upper part of the antrum. Such a function, however, could easily be attributed to a cyanophile secretion, produced, if such existed, by typical glandular cells (lacking cilia). On the contrary, I am inclined to assume that the existing granulae can play a part in the firmness of the cell. There might be a demand for this when the penis reaches its maximum expansion, when even the wall of the antrum is projected and becomes, so to speak, the

base of the copulatory implement. In such a case the antral epithelium would need reinforcement. I might here refer to the lining of the cirrus in *Planoceridae* to aid in the understanding of the purpose of these antral cells. But there is, of course, no question of homologizing.

This peculiar organization of the epithelium is limited to the two upper thirds of the antrum. It should further be emphasized that the cells are very narrow, that they reach a height of 6-8 μ, and that the elongated nuclei occupy the center of the cells. There is a distinct limit between these and the extremely thin penis-epithelium.

In the wall of the antrum, there is, moreover, a well-developed circular muscle layer, traversed by longitudinal muscular fibres. In the surrounding parenchymatous tissue numerous coarse protractor fibres, as well as bundles of dorso-ventral muscle fibres, occur. The retractor fibres of the copulatory organ are, on the other hand, very feebly developed.

The male aperture is a little back of the posterior border of the pharyngeal pocket. In *colobocentroti* $^2/_3$ of the space between the mouth and the male aperture is occupied by the pharyngeal pocket, only $^1/_3$ being left for the vesicula seminalis, the prostate vesicle, and the penis. In *hawaiiensis* the male apparatus is more removed from the pharyngeal pocket.

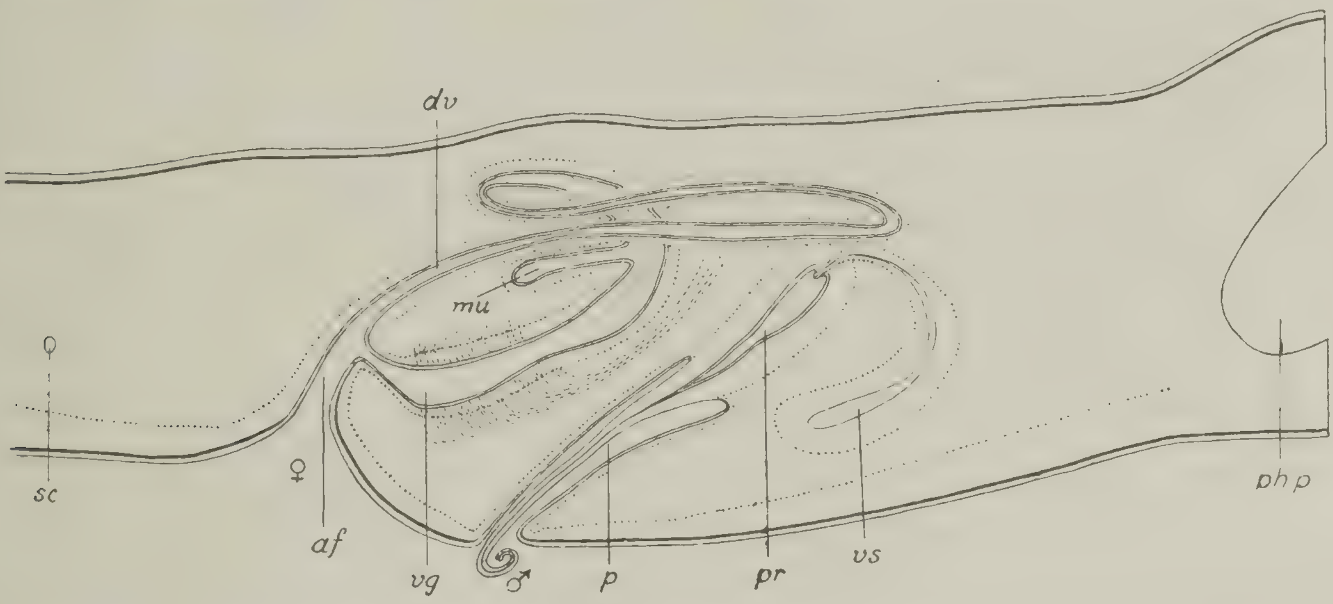
The female apparatus. The following description refers in the first place to the specimens from Krakatau.

The female copulatory organ in *Ceratoplana* differs decidedly from that characterizing the genus *Stylochoplana*, which, as mentioned earlier, *Ceratoplana* in its general organization the most resembles. While *Stylochoplana* without exception possesses a Lang's glandular vesicle, such an organ is here absent. Instead of this, a canal runs in a caudal and ventral direction from the entrance of the median uterine duct to the female gonopore, and this communicating canal represents, what I have called the ductus vaginalis (Bock, 1913, p. 40 and text-fig. 13). As such it probably corresponds to the duct leading to Lang's glandular vesicle (compare next chapter). In its general appearance this female genital apparatus agrees more with that which I have described for a Stylochid from South Africa, *Cryptophallus wahlbergi* (Bock, 1913, p. 123, text-fig. 13), than with the apparatus of any other Polyclad.

The only female gonopore is a short distance back of the male aperture (text-fig. 6 and 7), and only separated from it by an interspace 0,15 mm. wide. The body-epithelium around the female aperture lacks glandular cells. From the genital pore a tube leads upwards. This soon divides into two, one of which is the direct continuation in a dorsal direction and represents the ductus vaginalis just mentioned, and the other, homologous to the vagina of *Stylochoplana*, continuing in a rostral direction. The short joint duct to the openings of these canals might be called an antrum femininum (af). But, it should particularly be noted that, as regards the morphology of the tube and the nature of the wall, there is the closest agreement possible between this part — antrum femininum — and its direct continuation upwards — ductus vaginalis. Judging from the actual conditions, as seen in the series of sections, one would, indeed, be entitled to say that the vagina opens into the lower part of the ductus vaginalis. The distinction of an antrum femininum then becomes, to a certain extent, theoretical. However, from a genetic point of view, the opening of the vagina into the ductus vaginalis can be regarded as a secondary feature. Without hesitation I must assume, that the acquisition of the ductus vaginalis took place a great deal later in the history of the genus than the development of the typical Polyclad-vagina. Thus, in the beginning, the genital pore must have belonged to the vagina. The reasons for such an assumption are found in the genus *Cryptophallus*, which shows a more primitive arrangement of the female copulatory apparatus. Here the ductus vaginalis opens together with the distal end of the vagina (Bock, 1913, text-fig. 13). And such, I believe, was the condition at one time in *Ceratoplana*. From a theoretical point of view it is, however, not quite excluded to assume that the development took place in a different fashion. It might be that *Ceratoplana* has had a special exterior opening for the ductus vaginalis, as in the case of *Trigonoporus* and *Bergendalia*, and that the original female genital pore (= the opening of the vagina) has been moved back towards the aperture of the ductus vaginalis and upwards along this duct. In my opinion, no real reasons for such an assumption exist. It would seem hasty to base such a theory merely on the close similarity of the morphology and histological development in the „antrum“ and the ductus vaginalis, when

the wall, as in this case, is so simple in its organization and shows so little differentiation. This similarity in the structure can easily have been acquired later, when the ductus vaginalis assumed the function of a vagina; i. e. to receive the male copulatory organ.

The epithelium diminishes in thickness in the genital opening and has in the antrum, as well as in the ductus vaginalis, only about one-half the stoutness of the body epithelium. Both tubes lack gland cells. The ciliated covering is feebly developed in the antrum, but slightly better in the ductus vaginalis. The thick basement membrane of the body-wall diminishes quickly in stoutness



Text-fig. 7. *Ceratoplana colobocentroti* var. *hawaiiensis*. Diagrammatic lateral view of genital apparatus 53 x. Explanation of letters in text-fig. 6,

inside the genital opening and becomes already in the middle part of the antrum as thin as a line. The muscularis of the wall of the antrum consists almost exclusively of circular muscle fibres and reaches twice the height of the epithelium. In the strict medial, sagittal sections the muscular layer looks as though it were the direct continuation of the circular muscle layer of the body-wall.

The vagina is very short, and, running forwards and upwards, describes a slight curve backwards. It is already at its outer beginning a great deal wider than the antrum femininum, but narrows in its upper part, which lacks shell gland openings. The median uterine duct (mu), which is of considerable length, is directed frontwards, and is, strangely enough, not any narrower than pars interna vaginae. From the entrance of the median uterine duct the ductus vaginalis forms the direct continuation of the va-

gina backwards, and runs, in the case of *colobocentroti*, in a slight curve down to the antrum. As mentioned earlier, the ductus vaginalis and the antrum agree in regard to the histological structure. The wall of the vagina is thicker than the wall of the ductus vaginalis, a condition that is particularly noticeable in the middle and lower part of the vagina. Here the epithelium is twice as high as in the antrum. The cilia are thick, dense, and about 20 μ long, i. e. twice the height of the cells. The musculature, on the other hand, is twice as thick as the epithelium and consists of compactly arranged circular fibres, but few longitudinal ones. Most of the shell glands empty into the medial part of the vagina, but their efferent ducts are present even as far as near the opening of the vagina into the antrum.

The Ductus vaginalis of Polyclads.

A synopsis of the presence of the ductus vaginalis in Polyclads is appropriate here. From the following summary it also appears that an analysis is really needed. The first description of such a canal in a Polyclad was given by Lang. He says: (1884, p. 314) „Eine im höchsten Grade eigenthümliche nicht nur bei den Polycladen, sondern überhaupt bei den Turbellarien ganz allein stehende Einrichtung zeichnet den weiblichen Begattungsapparat von *Trigonoporus cephalophtalmus* aus (Taf. 30, Fig. 8). Bei dieser neuen Art und Gattung verlängert sich der Eiergang über die Einmündungsstelle des unpaaren Verbindungsstückes mit dem Uterus hinaus nach hinten und unten in einen Canal, der schliesslich in einiger Entfernung hinter der weiblichen Geschlechtsöffnung auf der Bauchseite in der Mittellinie nach aussen mündet. Dieser Canal ist mit einem mässig hohen Flimmerepithel ausgekleidet. Er ist ähnlich wie der Stiel der accessorischen Blase von Leptoplana Droebachiensis und Lept. vitrea, durch regelmässig wiederholende, zahlreiche Einschnürungen in hintereinander liegende Blasen abgetheilt. Der Canal besitzt eine kräftige Ringmuskulatur, welche besonders in den Einschnürungen compact entwickelt ist, so dass sie hier eine Sphinctermuskulatur des engen Verbindungsstückes zwischen zwei aufeinander folgenden Blasen darstellt. Zwischen Ringmuskulatur und Epithel beobachtete ich an vielen Stellen ausserdem noch Längsfasern. In morphologischer Beziehung erinnert der Canal,

insofern er eine Verbindung zwischen der Einmündungsstelle des Uterus in den Eiergang einerseits und der Aussenwelt andererseits darstellt, einigermaassen an den Laurer'schen Canal der Trematoden und Cestoden." I will discuss his interpretation of the function of this canal later. In my treatise on the terminology of the genital apparatus in Polyclads (Bock, 1913), I introduced, as already mentioned, the name ductus vaginalis for this canal.

Verrill (1893) mentions two species of the genus *Trigonoporus* from the New England coasts: *Tr. folium* and *dendriticus*. The former was already described in 1873 as *Leptoplana folium*. „In the structure of the reproductive organs, and especially in having two orifices for the female duct, these species both agree well with the type species of *Trigonoporus*." (1893, p. 489). About *T. folium* he says: „The anterior female pore is near the male orifice, and in some specimens, owing to contraction of the tissues, both are brought close together into a single pit-like depression; the dorsal portion of the female duct is somewhat elongated, and its posterior opening is at a considerable distance from the anterior orifice; the ventral part of the duct is shorter and broader, and it receives the ducts of numerous shell-glands; at its upward bend it is considerably dilated, and this part probably serves as a spermatheca. Behind the second female orifice there is usually visible a slender median duct which appears to terminate in a minute median pore; this is, perhaps, the central nephridial duct, but its extension forward could not be traced in the preparations." Figures from the mounted specimens are reproduced on his Plate 44, Figs. 6 and 7. All that is said about the female organs in *T. dendriticus* (Plate 44, Fig. 3) is that „the anterior female orifice is a little distance back of the male orifice; the glandular part of the vagina is elongated, and its posterior orifice is situated well back."

When the identification of the entire structure of the genital apparatus is, as in this case, exclusively made on a mounted specimen, it is always a little unreliable.

It should be emphasized here that no „central nephridial duct" is known in Polyclads, and therefore, it seems very likely to me that this duct belongs to the female apparatus. On his figures (Plate 44, Figs. 6 and 7) it can be seen running forward to the posterior female opening mentioned. A sectional examination of

Verrill's two species of *Trigonoporus* would be desirable. I have wondered if possibly the opening indicated as the male aperture might represent that of the penis-sheath, and the „anterior female opening" the outer male aperture; thus the orifice of the vagina would correspond to what Verrill calls the posterior female opening, while the orifice of the ductus vaginalis would, in its turn, become what has been indicated as the pore for the nephrideal duct. At present I am not able to decide this question.

The genus *Bergendalia*, with the species *B. anomala* from Malacca north of Penang, is introduced by Laidlaw (1903, p. 310), and is described as „a most remarkable and interesting form, probably allied to the anomalous genera *Cryptocelides* and *Polypostia*, described by Bergendal, and provisionally referred to the same family with them." In 1913 I ranged this genus, provided with duplicate male organs, close to the family *Stylochidae*, a procedure adopted by Yeri and Kaburaki in 1918. However, it might now be right to include *Bergendalia* in the family *Stylochidae*, although my supposition as to traces of tentacle-rudiments and tentacular eyes has not been verified as yet. Laidlaw gives the following description for *B. anomala*: „The female apparatus is no less remarkable than that of the male. The vagina runs forward for some little distance from the aperture, then turns upwards. As it does so, it is twisted into a remarkable spiral coil, making some five complete turns. It then runs backwards, narrows considerably, and soon receives the openings*) of the two uteri on its ventral side. Beyond this point it is continued back as a narrow accessory vesicle about as far as the level of the female aperture, when it turns sharply ventral-wards and *opens to the exterior by the antrum*". „The curious spiral twisting of the vagina is, so far as I know, unparalleled in the order". Laidlaw's comparison to a „narrow accessory vesicle" cannot be taken strictly, as no expansion occurs. The description of the entire structure of the vagina is followed by this statement: „The rest of the terminal female ducts are precisely similar in character to the first part of the vagina, only

*) It should be noted that, judging from Laidlaw's picture as well as for theoretical reasons, it is probable that *B. anomala*, like the *B. diversa* Yeri et Kaburaki, possesses an unpaired median uterine duct; consequently, only one opening to the vagina.

narrower. There seem to be no special shell-glands present." And on the outline of the genital apparatus (l. c., text-fig. 54) no trace of any dilation or change can be seen where the accessory vesicle („acc.") is indicated. Laidlaw's statement: „The accessory vesicle of the female apparatus opens to the exterior through the antrum femininum" must, therefore, probably be considered as a derivation of the ductus vaginalis from Langs glandular vesicle (= „accessory vesicle").

Yeri and Kaburaki (1918, p. 8) introduce another species of the genus *Bergendalia; B. diversa* from Japan (prov. Awa) and describe the female apparatus (l. c., text-figs. 7 and 8) as follows: „The female aperture leads into the vagina which is extensively surrounded by numerous shell glands and which proceeds obliquely forward and upward for some distance, being twisted at a part of its course into a compact spiral coil of some five turns. It then bends backward, becomes gradually narrowed, and is soon joined on the ventral side by the single uterine duct coming from behind. Beyond this point the vagina runs backward and downward, describing an arched course, which part is known by the name of vaginal duct. This finally opens into the antrum femininum closely behind the vaginal aperture and just inside the external female aperture. Thus the vagina and the vaginal duct together form a nearly complete, irregular circle. The unpaired uterine duct is very short and divides posteriorly into two tubular uteri."

Cryptophallus wahlbergi Bock 1913 from South Africa (Port Natal) belongs without doubt to the family *Stylochidae*. As in *Bergendalia*, there is only a single female sexual pore. The vagina (sensu stricto) is of the *Stylochus*-type and the narrower ductus vaginalis, which is a little shorter, unites with the vagina in its most distal part, just above the female gonopore (Bock, 1913, p. 123, text-fig. 13).

Tripylocelis with the species *T. typica* Haswell from N. S. Wales (Port Jackson) possesses a short ductus vaginalis, which opens independently a short distance back of the normal female orifice. Haswell describes the female apparatus as follows (1907, p. 467, Pl. 35): „The chief (anterior) female aperture leads into an ootype of long-oval form with greatly plicated walls. At its anterior end this bends back and passes into the dorsal limb of the vagina.

The latter runs backwards near the dorsal surface of the body, and receives from below the unpaired ducts formed by the union of the right and left uterine ducts. Instead of terminating blindly or expanding into a receptaculum seminis, as in most other Polyclads, the vagina then bends downwards and opens on the ventral surface some little distance behind the main female aperture. This posterior continuation of the oviduct has a thick muscular wall; its epithelium is raised up into a number of longitudinal ridges. Behind the point where the median uterine duct leaves it below a process of epithelium projects into the lumen; this may, perhaps, act as a valve for preventing the passage of the eggs backwards to the posterior female aperture.“ Haswell then speaks of the genera *Trigonoporus*, *Bergendalia*, *Laidlawia*, and *Polyporus*, and classifies the *Tripylocelis* with the family *Planoceridae*. I have later presumed that it belongs to the family *Leptoplanidae* (Bock, 1913).

Another Leptoplanid, *Copidoplana paradoxa* Bock, living on corals in the Gulf of Siam, has a very short ductus vaginalis, which runs almost straight downwards from the entrance of the very small median uterine duct and has a separate aperture back of the joint opening of the vagina and the antrum masculinum. The outer part of the vagina is developed into a „vagina bulbosa“ (Bock, 1913, p. 216, text-fig. 46).

From the list of Polyclads with a ductus vaginalis we can omit *Polyporus coecus* Plehn from Spitzbergen. As I will show elsewhere, this is a defective specimen, in which the duct to Lang's glandular vesicle, as well as the intestinal coeca, seem to open outwards simply as a result of a mechanical injury to the margin of the body.

If we summarize what has been said, we find in Polyclads that within the sub-order *Acotylea* there has developed, as a direct continuation of the inner end of the vagina, a duct, which either has a separate opening back of the normal female gonopore (*Trigonoporus*, *Tripylocelis*, and *Copidoplana*), or fuses with the distal end of the vagina, so that only a single orifice for the female apparatus occurs (*Bergendalia*, *Cryptophallus*, and *Ceratoplana*). Thus, in the latter case the female genital apparatus has a circular-like passage. *Trigonoporus* is classified with the family *Latocestidae* (Bock, 1913). *Cryptophallus*, as well as the genus *Bergendalia*, belongs to the family *Stylochidae*. The remaining *Cera-*

toplana, *Copidoplana*, and *Tripylocelis* belong to the family *Leptoplanidae*, which has highly varying genital organizations, but in a limited degree.

All the genera mentioned lack Lang's glandular vesicle! In this respect the family *Leptoplanidae* is of particular interest. This very natural family, with the limitation that I gave it in 1913, contains Polyclads with a very characteristic habitus. A great number of species inhabit the temperate and warm seas, and they show as a rule a wealth of specimens. If, as is frequently the case, the external features do not give sufficient characteristics for the different species, a condition that already caused Lang to desist from making any determination without a sectional examination (Lang, 1884), an examination of the copulatory apparatus, which presents numerous types of organizations, will provide good results. The male organ shows the greatest specialization, but the female apparatus also presents no little deviation in different species. The greatest differences are found just in respect to Lang's glandular vesicle. It often occurs as a globular projection. At times it reaches extraordinary dimensions, forming a long and wide sac (for instance, *Notoplana atomata* and *australis*, *Zygantroplana*), but frequently it shows degeneration, and may even in some species be entirely missing. A typical case of reduction is seen in *Notoplana evansi* Laidlaw in the shape of a short duct with a barely noticeable caudal projection (Bock, 1913, text-fig. 35, p. 189). Its location here is particularly remarkable, as it lies immediately alongside the vagina. In the genus *Stylochoplana*, to which *Ceratoplana* shows such marked relationship, there is, as a rule, a Lang's glandular vesicle, although of small dimensions. *Stylochoplana pusilla* from Japan (Bock, 1924, Plate, fig. 4) shows most clearly how close it really can approach to the female gonopore. Under such circumstances it would seem quite plausible to consider the development of a ductus vaginalis in conjunction with the preexistence of a Lang's glandular vesicle, and thus assume, that the ductus vaginalis has been derived from the duct leading to the Lang's glandular vesicle. This duct forms the direct continuation of the inner end of the vagina and runs in a caudal direction. *Idioplanoides* (*Woodworthia*) *atlanticum* (Bock, 1913, text-fig. 25) shows clearly how close this duct can lie to the vagina, with the

muscular layers of both even in immediate contact with each other. Those who have ever noticed the young stages of the copulatory organs in Polyclads, in form of strings of accumulated cells, can easily conceive how small a shifting in location would actually be needed to bring about a fusion. The alimentary system in Polyclads presents splendid examples of fusions of epithelial layers on a large scale. In several families we simultaneously find species with only a branched intestinal system and species with richly anastomosing gut-diverticula. In *Discocelides Langi* most of the intestinal coeca simply form branches, but in the anterior and posterior parts of the body they always anastomose (Bock, 1913, p. 81). In *Stylochoplana gracilis* Heath and McGregor, to give an example from the same genus of Polyclads, the intestinal apparatus anastomoses freely, while in most other *Stylochoplana*-species it only branches.

I have merely used these various examples in order to demonstrate the lability that exists in Polyclads. The male and female apertures in Polyclads might likewise sometimes fuse into a single one. This is the case, for instance, in *Stylochoplana maculata* Quatrefages, while other species of *Stylochoplana* have separate genital openings. The best example that I have seen of fusion of the distal parts of the male and female efferent ducts is, however, in a new *Pericelid*-genus, *Thalattoplana*, from the Bonin Islands in the Pacific.

I cannot see any real obstacle for the assumption that the ductus vaginalis has originated from the duct belonging to Lang's glandular vesicle. An additional reason for such a conclusion is found in *Discocelides Langi* Brgdl., where a canal connects the duct of Lang's glandular vesicle with the distal part of the vagina. I do not intend to urge *Discocelides* as the original type from which Polyclads provided with a ductus vaginalis have developed. The case mentioned indicates best how various conditions may occur, and how one may be entitled to the reasoning given above.

Therefore, I must draw the obvious conclusion that the ductus vaginalis corresponds to the duct leading to Lang's glandular vesicle and genetically has been derived from this duct. We shall no doubt also find that there are reasons to believe that such a change into a ductus vaginalis has taken place on its own accord in various cases, in *Leptoplanidae* as well as in *Stylochidae*.

In the family *Leptoplanidae*, besides the case of *Ceratoplana*, the ductus vaginalis is, as mentioned, present in *Copidoplana paradoxa* Bock and in *Tripylocelis typica* Haswell. In both cases the duct has a special outward opening. *Copidoplana* resembles *Notoplana* most closely in its organization, if one leaves out of account that there is an atrium genitale commune into which the antrum masculinum and the vagina open. *Tripylocelis* has its male and female orifices well separated, and this Polyclad seems to resemble *Discoplana*. With its single female gonopore *Ceratoplana* is no doubt most related to *Stylochoplana*. Therefore, this similarity in the organization, i. e. the presence of a ductus vaginalis, is not sufficient reason to warrant bringing the divergent genera *Copidoplana*, *Ceratoplana*, and *Tripylocelis* more closely together. An examination of the numerous species that belong to *Notoplana*, *Discoplana*, and *Stylochoplana* reveals that in each of the three genera all the various stages in the reduction of Lang's glandular vesicle, from a very good development to almost complete disappearance, are found. In almost every case, however, the duct is retained. It is sufficient to mention only a few cases: In *Discoplana pacificola* (Plehn, 1896) the glandular vesicle is quite large; in *D. subviridis* (Plehn, 1896) horse-shoe shaped; in *D. concolor* (Meixner, 1907) small; in *D. malayana* (Laidlaw, 1903) almost completely rudimentary, with only the very muscular duct retained. A glance at pages 187—214 in my treatise of 1913 furnishes many additional examples in regard to the genus *Notoplana*, and numerous new species of the family *Leptoplanidae* in my later collections from the Pacific confirm this idea. In the sub-order *Acotylea* most species possess Lang's glandular vesicle with its duct as a continuation inwards of the vagina interna; this duct has, consequently, during the reduction of the glandular vesicle either received an outward opening of its own on the ventral side back of the female orifice, or joined the distal end of the vagina. In *Trigonoporus* the ductus vaginalis has the characteristic beaded appearance that so often is noticed in the duct of Lang's glandular vesicle. Moreover, in the sub-order *Cotylea*, which almost without exception lacks a Lang's glandular vesicle (compare Bock, 1923 b), there is, in accordance with this fact, no continuation of the vagina in the shape of a ductus vaginalis. This circumstance is in perfect agreement with the theory.

Herzog (1905) and Zàhony (1907) have treated the Cotylean genus *Laidlawia* possessing a peculiar vesicle with a dorsal end-pore, and I will deal with this subject in the publication of the German South-Polar expedition, as this interesting Polyclad was collected at Kerguelen. However, in no event is such an organ homologous to the ductus vaginalis in *Acotylea.*

The function of the ductus vaginalis: No observations have been made on the method of copulation in the Polyclads possessing a ductus vaginalis. Theoretically one may expect that either the vagina or the ductus vaginalis are supposed to receive the penis, unless the sperma is directly injected into the tissues. The latter method is used by many Cotylean Polyclads, which possess a penis armed with a stylet (see Lang, 1884, Bock, 1913). The spermatophores can, when such occur, be deposited anywhere in the body, Neither of these two methods of hypodermically injecting the sperma is probably used by Polyclads with a ductus vaginalis. An examination of the male apparatus is sufficient to show that this is not the case. In passing, it migt be mentioned, that *Ceratoplana* has masses of sperma in the distal ends of the uteri, and that the parenchymatous tissue of the body lacks spermatozoa.

In *Copidoplana*, with its joint opening for the vagina and the antrum masculinum, the use of the ductus vaginalis as a receptacle-tube for the penis would make possible, or at least facilitate, a simultaneous mutual copulation. The organization of the penis seems directly to harmonize with the interpretation that it is intromitted into the short, narrow ductus vaginalis (Bock, 1913, text-fig. 46). As the penis-stylet does not consist of a firm, „chitinous“ substance, it does not seem suited for hypodermal injections nor able to pierce the thick basement membrane of the body. In *Tripylocelis*, which has quite a short and unarmed penis, the median uterine duct has such a location that the injected mass of spermatozoa can easily make its way further into the uteri. The location of this backward-directed median uterine duct, which is very unfavourable for the deposit of the eggs, is improved through the development of „a process of epithelium, acting as a valve for preventing the passage of the eggs backwards to the posterior female aperture“ (Haswell, 1907; the valve is, however, not shown on the figure presented). (Of course, it is theoretically possible that

this same valve might be an obstacle to the escaping of the sperma, in case this were injected into the vagina, but I find Haswell's explanation most plausible.) Examining the organisation in *Ceratoplana colobocentroti,* and var. *hawaiiensis*, one finds that the ductus vaginalis has a far more suitable location for the reception of the penis than the vagina, The ductus vaginalis forms the direct continuation of the antrum femininum, while the vagina opens into the antrum femininum at a right angle. The unusual length of the ductus vaginalis in *C. hawaiiensis*, as well as its loop, seems to be particularly adapted to prevent the sperma from being ejaculated past the median uterine duct and out via the vagina. In this way the mass of sperma is effectively obstructed, and the sperms can make their way into the uteri. Still another argument for the use of the ductus vaginalis in the copulation act is that the penis, lacking a stylet, is very long and unusually narrow. It would hardly have such a length if it were only to be inserted into the antrum femininum.

In *Bergendalia anomala* Laidlaw the ductus vaginalis runs from the female orifice strictly upwards, while the vagina is directed frontwards. The perpendicular location of the penis in this species seems to indicate that the penis is inserted in the ductus vaginalis. The diagram of *B. diversa*, given by Yeri and Kaburaki, does not suggest how the act of copulation takes place. Both Laidlaw, and Yeri & Kaburaki say that the vagina in the *Bergendalia*-species is „twisted into a remarkable spiral coil, making some five complete turns“ (*B. anomala*), or „twisted at a part of its course into a compact spiral coil of some five turns“ (*B. diversa*). Unfortunately, no particulars are given in these descriptions as to the openings of the shell glands. Laidlaw merely says: „. . . a great number of nuclei massed around the vagina, and probably belonging to gland cells. Where the vagina turns dorsalwards and becomes spirally twisted it has narrowed slightly, but its epithelium retains the characters already mentioned“ (= „elongated columnar cells the nuclei of which lie near their bases“). Yeri and Kaburaki only state that the vagina „is extensively surrounded by numerous shell glands“, and their diagram does not clearly show the extent of the shell duct. The spiral development of the epithelium of the vagina may be intended for the purpose of prolonging

the passage of the eggs during shell-formation and meanwhile giving the eggs a rotation. It seems very plausible to me that it might at the same time act as an effective obstacle to any mass of sperma injected into the ductus vaginalis. In this connection I might point out, in order to avoid any misunderstanding in the future as to the organization of the vagina in the genus *Bergendalia*, that very likely the spiral twist only concerns the epithelium of the vagina and originates through the formation, by higher epithelial cells, of a spirally running ridge, and that the thin basement membrane of the vagina and the muscular wall are not affected by it. This is not mentioned in the descriptions, but I feel that I have the right to draw this conclusion from my knowledge of the condition in some Stylochids that have not been described as yet, and because of the information derived from the outline diagrams of sagittal sections of the *Bergendalia*-species.

Returning to the function of the ductus vaginalis, there only remains to be mentioned that Lang, in his description of this duct in *Trigonoporus cephalophtalmus*, naturally did not neglect to discuss its purpose. On account of its structural development (see Lang's description and diagram), he considers the duct as having the function of a pump (p. 315). He denies, with full right, that the eggs are emptied by means of it. „Es bleibt also nur die Möglichkeit, dass Stoffe von aussen in den Eiergang hineingepumpt werden, und da könnte man vielleicht vermuthen, dass die Pumpe dazu dient, Samenmassen in den Begattungsapparat hinein zu befördern." He then adds that, from a morphological point of view, the canal resembles to a certain extent Laurer's canal in the Trematods and the Cestods. However, it seems hardly probable to me that the beaded appearance of the duct is due to an adaption to its present function, but on the contrary that it is a remnant of the structure of the duct from the time when this duct belonged to a Lang's gland vesicle. The ductus vaginalis in *Trigonoporus* seems less suited to copulation. Such a use would certainly have required and brought about a change in its appearance. It seems more plausible that such a method of copulation has not developed as yet, but that the vagina in this species still acts as the copulatory organ. In such a case the beaded structure retained by the vagina is supposed to retard the sperma. Superfluous sperma and the pro-

static secretion are later emptied to the outside; the vigorous sperma has then already made its way through the median uterine duct into the uteri, where the spermatozoa fertilize the eggs. According to such an interpretation, the organization of *Trigonoporus* should hypothetically represent an earlier stage in the change of the duct of Lang's glandular vesicle. The ductus vaginalis is not yet adapted for the act of copulation, a function that it probably has in the other cases.

Conclusion.

In regard to the systematic position of *Ceratoplana*, it has already been pointed out that there is a marked relationship to the genus *Stylochoplana*. Detailed explanation seems unnecessary, as doubts can scarcely arise after the above description. The discussion of the ductus vaginalis also shows that this feature, the most characteristic of *Ceratoplana,* can be traced directly back to the organization of *Stylochoplana*. The idea of the ductus vaginalis as originating from the duct of Lang's glandular vesicle has here, for the first time, been given a detailed and full explanation. This analysis also gives an acceptable explanation of the fact that the ductus vaginalis may occur here or there in various Acotylean families. This assumption is based on the fact that Lang's glandular vesicle belongs to the organization-plan of such families where a ductus vaginalis occurs. The discussion also verifies my statement of 1913, that the organization of the female apparatus is of little value in the classification of *Acotylea* into families. Anything else is hardly to be expected, when one may find such an extraordinary agreement in the female apparatus as exists between that of certain Triclads (for instance, *Procerodes*-species) and that of Polyclads (*Stylochoplana*, to use only one example). In species of *Procerodes* we recognize the „Eiergang“ as the median uterine duct of Polyclads, and the vagina of Polyclads in the part lying distally to the orifice of this duct (this part is named „Drüsengang“ by Böhmig, „Vaginaloviduct“ by Wilhelmi). The vagina of the Triclads continues proximally in the duct leading to the „uterus“. This „Uterus“ and „Uterusstiel“ (v. Graff in Bronn) or „Receptaculum“ and „Vaginalstiel“ (Wilhelmi) I regard as homologous to Lang's glandular vesicle and its duct (see Bock, 1923 b).

To the genus *Ceratoplana* I give the following diagnosis:

Leptoplanids with somewhat elongated, anteriorly widened, posteriorly narrowed body. Well-developed, long tentacles. Mouth situated far back in the centrally located, very long pharyngeal pocket. Few non-anastomosing intestinal coeca. True vesicula seminalis directly back of pharynx opening into a well-developed, unchambered prostate vesicle. Penis long, narrow, and unarmed. Two genital apertures near each other but at a decided distance from the posterior margin of the body. Vagina short. Ductus vaginalis present. Both canals open into a common antrum femininum.

II.

A Stylochidean Polyclad with Ductus genito-intestinalis.

(Plate II).

In the previous report I have dealt with the representatives of a new Leptoplanid genus, *Ceratoplana*, which Dr. Th. Mortensen has collected underneath the sea-urchin *Colobocentrotus atratus* L., both in Hawaii and in the Sunda Strait. Together with the specimens of *Ceratoplana colobocentroti* var. *hawaiiensis* there was found also a representative of another Polyclad family, *Stylochidae*. When first sorting out the collection, I supposed that it was merely the question of a species of the widely spread genus *Stylochus*. But a later, more thorough examination disclosed characteristics that did not quite harmonize with that opinion. The tentacles were too much reduced, being hardly discernible; the genital pores, although rather close to each other, were too far removed from the posterior margin of the body; the pharynx was rather short. In addition, a pair of false seminal vesicles, distinct and of a large size, was detected, when the specimen was mounted in oil of cedar. A series of sections through the genital apparatus was then necessary and the following examination not only verified the assumption as to a new genus but also brought about the quite unexpected discovery of a ductus genito-intestinalis. Such a connection is extremely rare in the whole Polyclad group, among all

Acotyleans it is known to characterize only one species, *Enterogonia pigrans* HASWELL, the single representative of an aberrant genus.

As only a single specimen was collected, it is advisable at present to desist from an opinion about an eventual commensalism. The find might perhaps be of a casual nature.

Discostylochus parcus n. g. n. sp.

The single specimen of this new Stylochid was collected at Hilo, Hawaii, in March 1915, underneath *Colobocentrotus atratus L.* Fortunately it is sexually mature. It measures in length 14 mm. and its greatest breadth is 10 mm.

The shape of the body agrees in a splendid way with that generally met with in the genus *Stylochus*. The broadly expanded and nicely rounded anterior end is photographically reproduced on Plate II, Fig. 1. The posterior half of the body narrows slightly and is consequently not so well rounded as the half-circular anterior end. The body is firm and consistent as in most Stylochids and rather thick (Plate II, Figs. 2 and 3).

Text-fig. 8. *Discostylochus parcus* n. g. n. sp. The animal in ventral aspect. As all the diagrams, this is drawn with the help of Abbe's camera. m, mouth; pr, prostate vesicle; ut, masses of eggs in the uterus.

During preservation the body has become bent, contracted, and folded in a way characteristic to the species of *Stylochus*. The vigorous musculature and the firmness of the body are the causes for the particular state of contraction so very often met with in Museum materials of that genus. In his valuable monograph on the Stylochines, Meixner, has given a couple of characteristic pictures (1907, Taf. XXVI, Figs. 1 & 2) of this condition. It certainly causes a great deal of trouble in the determination and diagramming of preserved Stylochids and makes it more or less difficult to construct an exact figure of the entire animal and to obtain a properly cut series of longitudinal sections.

The general colour of the alcoholic specimen was slightly brownish on the dorsal side, without being noticeably more concentrated along the median line. There was no pattern of any kind retained. No notes were taken as to the colour during life.

The tentacles are so inconspicuous that only the tentacular group of eyes situated thereunder proves that the slight prominences in question really represent rudimentary tentacles. They are located at the posterior border of the first fifth of the body, and have a circular outline; their diameter is comparatively large. A line connecting them would run a short distance in front of the brain.

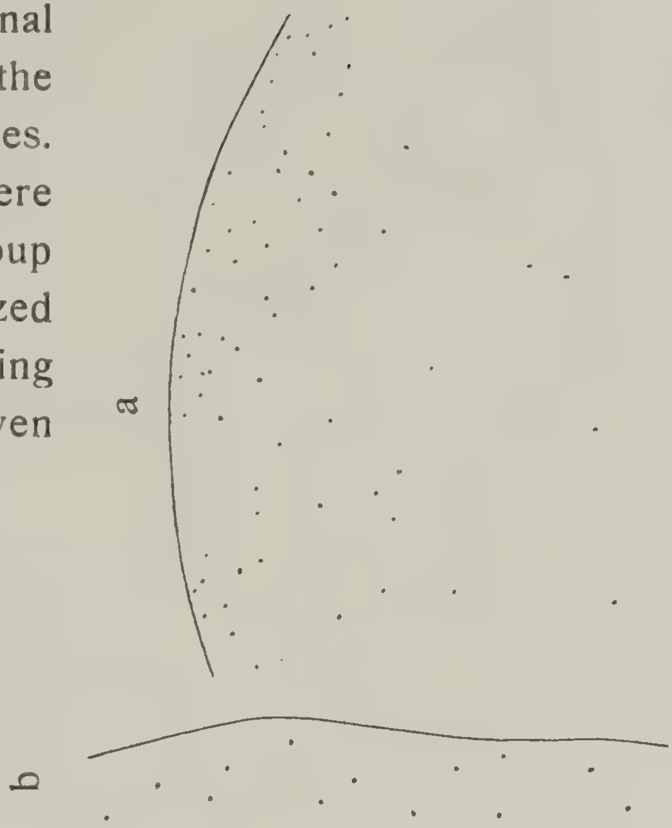
The brain is inconsiderably longer than it is wide, with straight posterior and slightly indented anterior borders.

The mouth is situated at the end of the second third of the body, and that would be at the border between the second and last thirds of the pharyngeal pocket. The pharynx is relatively short, only about a third of the whole length of the animal. As the greater part of the pharynx lies back of the animal's median-point, the distance from the pharynx to the posterior margin of the body is about $^2/_3$ the distance from the pharynx to the frontal line of the body. For being that of a Stylochid, the pharynx is moderately folded and the pharyngeal pocket has only a few, but very deep side-chambers. The alimentary system otherwise presents ordinary features, and it might only be mentioned that the simply branching coeca are not very densely arranged (Plate II, Fig. 1).

The genital pores lie very close to each other, separated only by an interstice, $^1/_{10}$ mm wide. They are located at about half the distance between external mouth and the posterior margin of the body, the female aperture being roughly $2{,}_2$ mm from the caudal end of the animal.

Arrangement of the eyes: The marginal eyes are numerous but very small. They occur chiefly at the anterior third of the body. Proceeding backwards, their number soon diminishes, and in the pharyngeal region there are only a few scattered ocelli. In spite of a diligent search, I have not been able to prove the presence of any eyes at the extreme posterior end of the body. At the frontal margin the more peripheral eyes arrange themselves in several rows as a narrow band, but interior to this they are irregularly and sparsely distributed in somewhat separated clusters, as is

shown in text-figure 9. The marginal eyes are further characterized by the scarce amount of pigment corpuscles. On each side of the median line there is a distinct tentacular eye-group (text-fig. 10). They can be recognized as such through the denser clustering of the ocelli, and the full proof is given



Text-fig. 9. Distribution of eyes. a. at the anterior margin of the body. b. at the margin in the middle pharyngeal region of the body. 25 x.

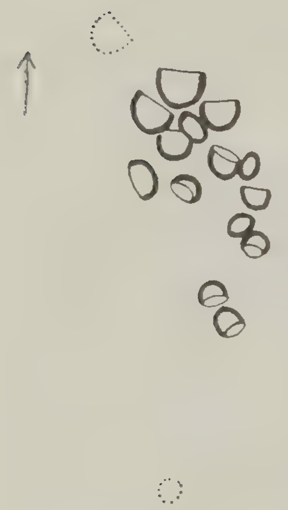
Text-fig. 10. Distribution of cerebral and tentacular eyes. The latter are marked black. Owing to the contracted and folded state of the animal, the left side of the picture is incomplete. The anterior border of pharynx, unpaired intestinal branch, brain, and uteri are also indicated. 24 x.

by the fact that they are more superficially located than the surrounding eyes. Text-fig. 11 shows the right tentacular eye-cluster with its 14 ocelli of varying sizes. The openings of the pigment cups are turned in different directions. In the brain area the eyes are numerous without forming two quite distinctly separated cerebral eye-clusters. Moreover, as scattered ocelli are found anteriorly and laterally, as well as back towards the pharynx, it is impossible to strictly distinguish the cerebral clusters. Therefore it is more correct to say that there are numerous eyes distributed all over the entire praepharyngeal zone, with denser grouping in

the brain area (these represent then the cerebral clusters), beneath the tentacle rudiments (as very distinct groups) and along the margin of the body. The diffusely scattered eyes between the cerebral eye-clusters and the marginal ocelli are then to be regarded as „frontal“ eyes.

The location of the genital pores in the family Stylochidae.

Since Meixner 1907 published his valuable treatise on *Stylochines*, our knowledge of the interesting and very natural family *Stylochidae* has considerably increased. The genera that have last been brought into this family are treated by Bock, 1923 b.



Text-fig. 11. Pigment cups of tentacular eyes, to show how differently orientated the eyes are. The dotted eyes do not belong to the tentacular group. The arrow is drawn on the median side of the eye-group. 112x.

I have made a list, which cannot, however, be published because of lack of space, of all that is known to date about the location of the genital pores in this family. Quoting a great many figures in such a table might perhaps give an idea of more exactness than is actually valid for animals with a body as easily contracted as that of Polyclads. The *relative* figures computed from the table and given below are then more significant, although even these may to a certain extent be influenced by differences in contraction of different parts of the body. But owing to the great consistency of the body just occurring in the Stylochids and the fact that the power of contraction is remarkably less in Stylochids than in many other Polyclads, the figures have a greater validity than could be expected from a mere knowledge of f. i. the Leptoplanids. Collectively they are of great aid in showing an unmistakeable tendency in *Stylochids* to move the genital pores toward the caudal end of the body.

I must here emphasize the absolute necessity of using direct measurement. In a modern treatise it is not sufficient to say, as has actually been the case, that the genital pores are „near the posterior end“ or „between the pharyngeal chamber and the posterior body end“, for such statements are rather useless in the diagnosis of *species*.

G r o u p I. In the genus *Stylochus* with its 24 identifiable species the distance between the female aperture and the posterior

margin of the body is usually $^1/_9$—$^1/_{20}$ the length of the body. *Stylochus hyalinus* Bock shows a distance value of $^1/_{24}$, and the most extreme case is *Stylochus nebulosus* (Girard), where, according to Meixner's measurements, it is $^1/_{33}$.

In *Parastylochus astis* Bock the female orifice has been moved so far back that the figure $^1/_{60}$ is obtained. This distance reaches its mininum within the family in *Meixneria furva* Bock with the figure $^1/_{130}$.

While the genital pores in these two genera never come very close to each other (the distance between them is $^1/_9$ the length of the body in *Meixneria* and $^1/_{27}$ in *Parastylochus*), this approach is always marked in the numerous Stylochus-species, where we may get figures less than $^1/_{100}$ of the body length.

The enumerated genera agree in the absence of Lang's glandular vesicle, a condition that facilitates the decided backward move of the female genital opening.

Group II. There are further four genera with altogether eight species that belong to *Stylochidae*. These genera agree in their possession of Lang's glandular vesicle. In all of them the male aperture lies close to the female one. The accessible figures for the distance of the female pore from the posterior body-margin in relation to the length of the body give the following results: *Neostylochus fulvopunctatus* Yeri & Kaburaki $^1/_4$, *Idioplana australiensis* Woodworth $^1/_4$, *Idioplanoides insignis* (Laidlaw) and *atlanticus* (Bock) about $^1/_7$, and *Limnostylochus annandalei* Kaburaki $^1/_{20}$.

Thus, the presence of Lang's glandular vesicle results in higher values, with the exception of the genus *Limnostylochus*, which we shall soon discuss. I might, however, point out here that *Limnostylochus*, as far as the location of Lang's glandular vesicle and the termination point of the uteri, i. e. in respect to the location of the proximal part of the vagina, agrees fully with the other genera enumerated in Group II.

Discostylochus lacks Lang's glandular vesicle. and one might feel that for this reason it should belong to Group I. But, as I shall discuss in detail later in this paper, I must assume that the ductus genito-instestinalis characteristic for this genus has been derived from the duct of Lang's glandular vesicle. On the basis of this assumption, therefore, *Discostylochus* must be classified with Group II.

Moreover, the distance from the female genital pore to the posterior margin of the body is not less than $^1/_6$ the body's length. Likewise the two genital pores lie very close to each other in this case.

Another member of *Stylochidae* is the genus *Cryptophallus*, characterized by the development of a ductus vaginalis. As this canal is also derived from the duct of Lang's glandular vesicle, I am classing this genus with Group II. The figure obtained for the location of the female genital pore here, in *C. wahlbergi* Bock, is much smaller, or $^1/_{10}$. Exactly the same figure is obtained for an undescribed *Cryptophallus*-species from Amboina. In both these species one might consider as the „causa agens" for the backward move the unusual extension of the pharyngeal pocket, which has reached such dimensions that it will also cover the male copulatory organ, a condition that is otherwise unknown in the *Acotylea*. As a result, the two genital pores have become more separated.

In the genus *Bergendalia*, which I brought close to *Stylochidae* (Bock 1913), there is likewise a ductus vaginalis. In regard to the location of the female orifice, the genus occupies a middle position between *Idioplanoides* and *Cryptophallus*.

A tendency in *Stylochidae* to move the female aperture backwards has been mentioned above. It is unmistakeable within Group I, as the location is exclusively caudal. This location does not only concern the genital pores, but also the entire vagina, which, consequently, is very short (see, for instance, *Stylochus pusillus* and *Parastylochus astis* (Bock 1913, text-fig. 23 and 15)). *Meixneria* alone deviates through the frontal location of the entrance of the uteri in the vagina, the ventral limb of which thus acquires an extreme length (Bock 1913).

The organization of the female apparatus varies much more within Group II. We consequently encounter greater variations in the location of the female genital pore in the genera of this group.

In the Stylochids provided with Lang's glandular vesicle the inner end of the vagina is at a marked distance from the posterior margin of the body. This is also true in the case of the genera *Idioplanoides* and *Limnostylochus*, where the vesicle in question has the shape of a horse-shoe with forwardly directed diverticula. This unusual shape can plausibly be explained as a backward move of the vesicular duct, causing the compression of the vesicle in the

length-direction of the body. Thus a kind of invagination is the result and two long lateral diverticula project forwards. The entrance of the duct into the vesicle is consequently at a short distance from the posterior wall of the vesicle.

In *Discostylochus* one may expect the proximal end of the vagina to retain a greater distance from the posterior margin of the body, as the ductus genito-intestinalis has brought about a connection with the digestive system.

In *Idioplanoides,* where the genital pores lie nearer the posterior margin than in *Idioplana,* we also find that Lang's glandular vesicle has the same horse-shoe-shape as that in *Limnostylochus.*

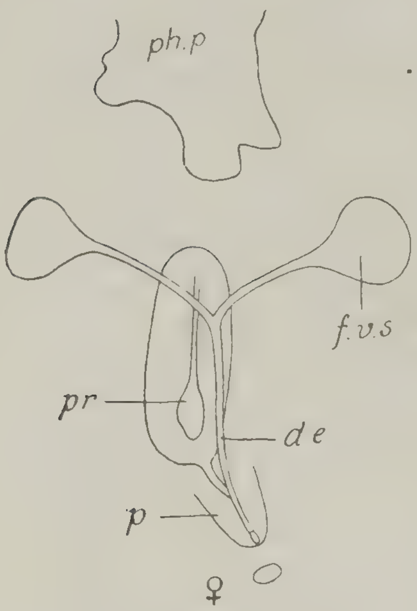
The backward move of the female apparatus in *Cryptophallus* has already been mentioned; moreover the development of a ductus vaginalis does not present any obstacles to it. The most marked caudal location of the female genital pore within Group II was, as mentioned, in *Limnostylochus,* and this has been brought about solely through considerable extension of the ventral limb of the vagina, an extension similar to that in *Meixneria* in Group I. The male genital apparatus in *Limnostylochus* has also approached the posterior margin of the body.

Thus we have also in Group II several representatives for a noticeable move of the female genital pore in a caudal direction even if it is not so strongly accentuated as in Group I. Increased knowledge of *Stylochidae* will certainly furnish additional examples.

The genital organs of Discostylochus.

The ovaries and testes have their normal location, dorsal and ventral respectively. The large seminal canals do not fuse caudally to the female genital apparatus. Each seminal canal, filled with large masses of sperma, runs its usual winding course to a very muscular „false vesicula seminalis", which it enters on its lateral side. Both pear-shaped vesicles (text-fig. 12) are in the zone immediately back of the pharyngeal pocket, at a distance of about twice the diameter of the vesicula seminalis from each other. The muscular wall consists of a maze of interlaced muscular fibres (Plate II, Fig. 3). These are not, as is usually the case, gathered in bunches, but each fibre runs separately. To compensate for this the muscular fibre becomes quite thick, even as much as 6 μ, and contains numerous

fibrilles. The muscular nuclei occur solely in the interstices between the fibres. Thus the zone of nuclei outside the muscular envelope characteristic for the true vesicula seminalis is entirely absent. A similar development of the muscularis may be found in the large seminal canals, so that the muscular wall of the seminal vesicles is simply such a musculature developed on a large scale. On their medial side each seminal vesicle sends out a short and muscular efferent duct, which runs somewhat obliquely caudad toward the median line. Into this duct the seminal vesicle, noticeably contracted during preservation, empties its content of sperma (Plate, Fig. 3). The two efferent ducts fuse underneath the prostate gland (Plate II, Fig. 4), at the border of its anterior third, into a ductus ejaculatorius, which runs in a straight line backwards to the penis. This is traversed almost in its entire length before fusion occurs with the nearly parallel-running efferent duct from the prostate gland (text-fig. 13). The ductus ejaculatorius is covered with a low, thickly ciliated epithelium, and is surrounded by a muscular layer that is more than twice as thick as that of the efferent duct of the prostate vesicle. In both ducts the longitudinal muscle fibres lie nearest the epithelium, and outside of these is the much stouter circular muscular layer.

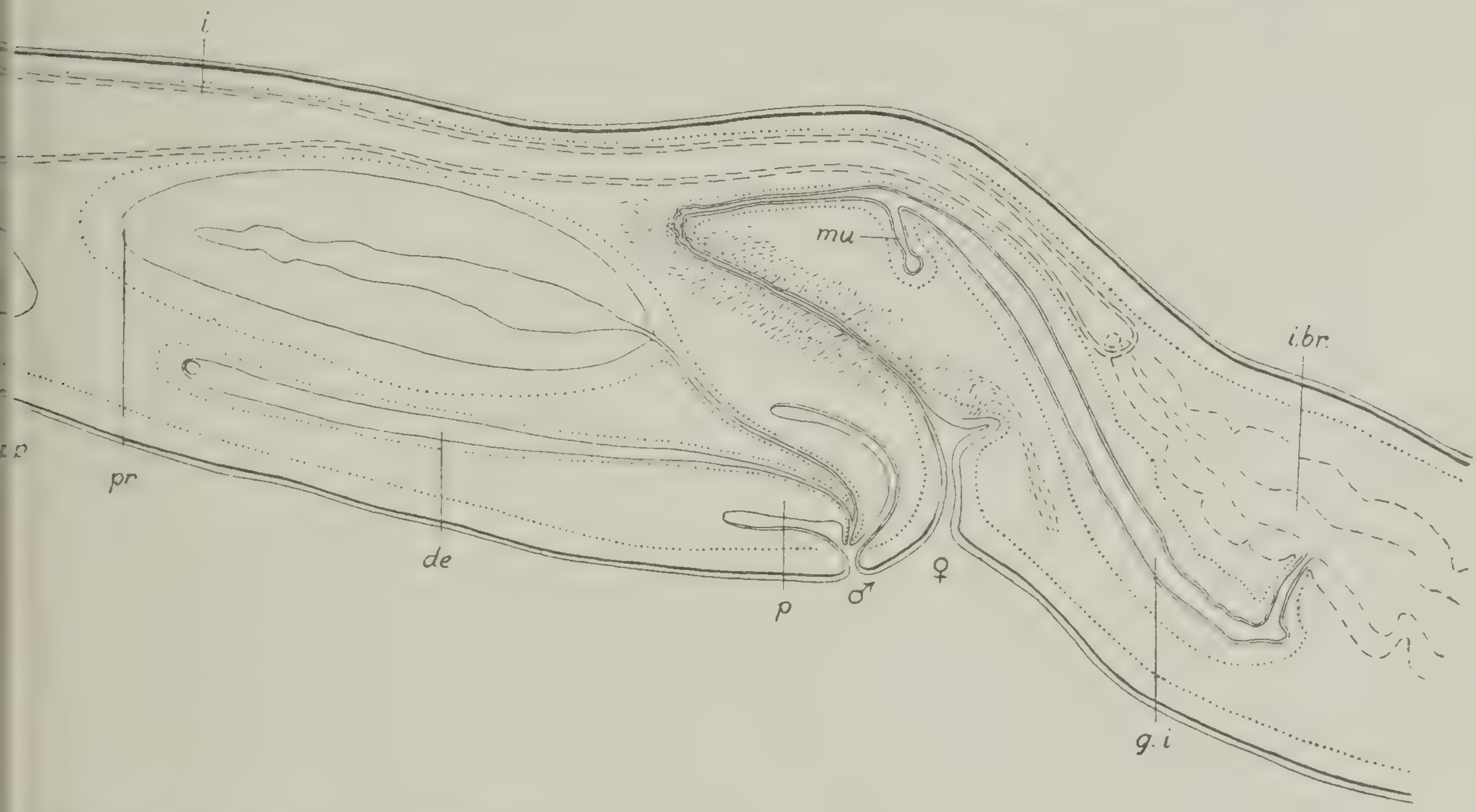


Text-fig. 12. Outline drawing of male genital apparatus seen in ventral aspect. d e, ductus ejaculatorius; f. v. s, false seminal vesicle; p, penis; ph. p, pharyngeal pocket; pr, prostate vesicle.

The prostate vesicle (Plate II, Fig. 4) has an elongated oval shape with a thick muscular envelope of sparse, thick fibres. Numerous efferent ducts from the extra-capsular prostate glands traverse the muscular coat. Internally the vesicle is lined with a low, slightly ciliated epithelium, which contains distinct cells between which the efferent glandular ductules from the underlying stouter layer of glands open. The vesicle is not chambered, but has only a few small and more lateral irregular folds of its epithelium. Medial sections disclose the straight, even outline of the epithelium; thus distinctly different from the more differentiated prostate vesicle of the genus *Stylochus*. The prostate is situated just in front of the penis, half-way between the dorsal and ventral sides,

occupying more than half the height of the body. Thus the posterior continuation of the main gut becomes flattened, its epithelium is lower, and there is no bead-like appearance. In this connection it might be mentioned that the female apparatus exerts even a stronger influence on the intestine, which becomes still more flattened. The normal thickness of intestinal epithelium does not return until back of the median uterine duct.

The penis is wide at its base, but diminishes quickly in width near its apex. The antrum masculinum is practically filled up by



Text-fig. 13. Male and female genital apparatus in lateral aspect. Semidiagrammatic. g. i., ductus vagino — intestinalis; i, main gut; i. br., intestinal branch gut; mu, median uterine duct. Other letters as in text-fig. 12. Border of the muscularis is dotted.

the penis (text-fig. 13). This has a caudal direction, and is unarmed, extremely muscular, and covered with an epithelium that becomes particularly low near the apex. Next to the thin circular muscular layer lying underneath the epithelium is a much thicker longitudinal one, which is followed by bundles of circular and retractor fibres in the thin parenchymatous tissue that surrounds the stout muscular coat of the two ducts that traverse the penis.

The female apparatus: The female copulatory apparatus is of special interest through the development of a ductus genito-intestinalis.

The vagina and its course is clearly seen in text-fig. 13. It is better developed than in the genus *Stylochus*. As in this

genus the distance between the female and male genital pores is small. Pars externa vaginae is nearly perpendicular, but the shell gland duct ootype runs over the antrum masculinum and reaches rostrally the level of the caudal end of the prostate gland. It is particularly interesting to note this location, as a peculiar condition exists in two *Stylochid*-genera, *Idioplanoides* and *Limnostylochus*, where the shell gland duct has been moved so far forward that it lies rostrally to the prostate gland. Thus we have in this new genus an obvious tendency in the shell gland duct to move forward. The influence brought upon the middle intestine by the copulatory apparatus, male as well as female, through their unusual development and location immediately back of the pharynx has already been mentioned. It is obvious that on account of the considerable size of the prostate vesicle in the Stylochids a better development of the shell gland duct would mean a removal of it from this vesicle. In the two *Stylochid*-genera mentioned above this has been possible, while keeping the genital pores close to each other, simply through an enormous extension of the pars externa vaginae, devoid of shell glands, giving the part of the vagina that forms the loop (i. e. the shell gland duct) a chance to develop fully in front of the male copulatory organ. Thus the change is dependent on the fact that sufficient space is lacking through the increase in size of the prostate vesicle.

I must here add a few words regarding *Idioplana*, as it is not improbable that the same condition exists in this Polyclad in regard to the shell gland duct as in *Idioplanoides* and *Limnostylochus*. Woodworth (1898), its only observer, gives no information as to where the shell glands empty. If his description is absolutely accurate, the shell gland duct must lie above the prostate gland. His description is as follows: „The female gonopore leads into a spacious bursa, from which the vagina, with diminishing calibre, leads upward and backward over the male organ, and receives the oviducts which open into it opposite to one another at a point above the posterior limits of the penis. The canal, which is ciliated throughout, and which from now on is reduced in diameter and uniform in calibre, passes forwards and downwards over the penis, reaching nearly to the ventral wall, and then bends upwards and backwards again, passing over the vagina and terminating a little posterior to the female gonopore in a vesicle or enlargement, „accessorische

Blase" (Figs. 4 and 5)." The description seems somewhat ambiguous; particularly after a comparison with the text-figures. The oviducts, i. e. the two uteri, should terminate „above the *posterior* limits of the penis". In the term penis Woodworth seems to include also the prostate vesicle, for he says: „There is a large muscular penis enclosing a spacious prostate gland („Körnerdrüse"), „and further on", the ciliated ductus ejaculatorius extends along the ventral wall of the penis, at the *posterior* end of which it divides into two vesiculae seminalis". In both cases the word posterior that I have italicized doubtlessly means anterior or proximal!! Regarding the interpretation of the vesiculae seminales, I refer to Meixner (1907, p. 141). When Woodworth in the first quotation above speaks of the vagina, which from „now on . . . . , passes forwards and downwards over the penis", he apparently includes the „ductus ejaculatorius" (= the median limb of the three-lobed vesicula seminalis), in order that the description may coincide with the diagrammed median section (Woodworth's fig. 5). With the aid of Woodworth's description and his two figures, Meixner has reconstructed a median section of the copulatory organs in *Idioplana* (1907, Taf. XXVIII, Fig. 2). The splendid agreement with Woodworth's figures admits no criticism. However, I may be permitted to doubt whether or not Woodworth has correctly reproduced the actual termination feature of the uteri. First of all, one would expect that, when Lang's glandular vesicle is present, the vagina would receive one unpaired median uterine duct instead of both uteri directly, and, secondly, it seems very improbable to me that the vagina is entered in its ventral part by the uterine duct. It contradicts the general organization of the vagina in the acotylean Polyclads, and especially in *Stylochidae*, where the proximal part of the vagina, if Lang's glandular vesicle is present, curves forward after it has received from beneath the median uterine duct. Therefore, in my opinion, it seems likely that Woodworth has overlooked the median uterine duct and has been misled by the two distal ends of the uteri, which tend to approach the median line, and which, of course, lie near and above the ventral limb of the vagina*).

*) The section of a canal that is seen on Woodworth's fig. 5, to the left of the downward bend of the vagina (Meixner interprets this bend as *uterus dexter*) and above the rostral border of the prostate gland is probably a

In this way the loop of the vagina lying rostrally to the prostate vesicle can thus be developed as shell gland duct in complete agreement with the condition existing in the three *Limnostylochus*-species and the two *Idioplanoides*-species. If Woodworth had mentioned anything about the openings of the shell glands, doubts would have been out of the question, and accordingly Meixner would hardly have drawn the median uterine canal to the lower limb of the vagina, as is the case in his diagram.

We shall now return to the histological structure of the female apparatus in *Discostylochus*.

Pars externa vaginae is at a short distance from its outer opening lined with a low, glandless, slightly ciliated epithelium, which is only about one third the height of the ventral epidermis. The muscularis is here about as thick as the muscular wall of the body, which it also resembles; in fact, the median sections suggest that the musculature is a direct continuation of this wall. The shell gland duct has an epithelium almost twice as high, and the ciliated covering is noticeably thicker. This is necessary for its special duty, that of distributing the shell secretion elements. Contrary to those of the foregoing part of the vagina, the muscular fibres, which are here of a coarser calibre, lie more sparsely, and the secretion ducts seem to hide, at least on the stained specimen, the existence of the muscular wall. Dense accumulations of shell glands terminate especially in the upper part of the shell duct, and here is a small dilation, the epithelial wall of which has a characteristic wave-like outline. The large number of secretory ducts present suggests that the actual work of forming the shells of the eggs takes place here. The furrows in the underlying epithelium are suited for storing the shell gland secretion. It is not improbable that the epithelial walls may be of some importance for the retardation of the sperma during the act of copulation, particularly as the vagina immediately after makes its sharp turn in a posterior direction. I might call to mind the fact that *Enterogonia* possesses shell gland ducts equipped with „a peculiar

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transverse cut of the distal part of one of the uteri. Near the vagina they run medianwards. The unpaired median uterine duct, probably existing also here, would then run backwards and upwards, as in the two known species of *Idioplanoides*.

spiral ridge of its epithelium", which is apparently developed for the purpose of retarding the passage of the eggs and perhaps at the same time cause their rotation, during which the shell gland substance would be applied. In *Bergendalia* this spiral ridge of the epithelial wall in the shell gland duct is even more pronounced. According to Laidlaw (1903), the vagina in *B. anomala* is „twisted into a remarkable spiral coil, making some five complete turns" and in *B. diversa* „twisted at a part of its course into a compact spiral coil of some five turns" (Yeri and Kaburaki 1918).

Pars interna vaginae has in *Discostylochus* an epithelium that is less ciliated but of a height similar to that of pars externa vaginae, and the muscular wall is also made up of fine fibres densely packed. The unpaired median uterine duct is directed upwards and slightly forwards and has, as in the case of the distal end of each uterus, a thicker and very compact circular muscular layer with a well-developed nuclear zone outside the muscularis.

Ductus genito-intestinalis forming the continuation of pars interna vaginae runs first backward and then curving along the vagina approaches the ventral musculature of the body. The cell plasma in the epithelial cells is very dense and gland cells are totally absent. After a sharp lateral turn the duct continues caudally, a little to the side of the median line, describing finally a sharp curve upwards, simultaneously making a lateral twist, and running to an intestinal coecum, which it enters on its ventral side (Plate II, Figs. 4 and 5). The lateral twists are the cause of the fact that in the section photographed to show the entrance of the duct in the intestine only a part of the epithelial tube of the ductus g. i. is present. The muscular wall on the photograph shows, however, that it is the same duct, and the neighbouring sections demonstrate clearly the epithelial tube and a non-compressed lumen.

Ductus genito-intestinalis has a well-developed epithelium, which is higher than that of the pars interna vaginae and has very thick ciliated epithelium (Plate II, Fig. 5). The muscular wall, as well as the epithelium, gradually increases in thickness, and consists almost exclusively of coarse circular muscle fibres. The muscular envelope is surrounded by a zone of nuclei (Plate II, Fig. 4), although at the same time scattered nuclei are found in the muscle layer. Some of these belong to the dilator fibres. One

might indeed feel that, in respect to the demands that might be put to it, this musculature is too well developed. It exceeds the muscularis of the vaginal wall, as well as the muscular wall of the body, both in thickness and in the coarseness of the fibres. I am inclined to believe that the more intensive stain of the fibres in comparison with other musculature of this animal is due to their contracted condition. This supposition is confirmed by the appearance of the slender cells in the epithelium of the duct as well as gaps in the surrounding parenchymatous tissue. From this fact one may conclude that the spaciousness and capacity of the duct is considerable. It seems plausible that the duct is first of all intended for sperma. However, the presence of eggs and egg-fragments in the intestine shows that the animal, through the existence of this duct, can utilize a part of its own egg-material as food. In this way the animal would economize to a very extensive degree and eggs or parts of eggs not adaptable for deposit would thus not be wasted.

The muscularis of the ductus g. i. has the same appearance all the way to the intestinal wall, only diminishing in strength, and, consequently, this muscularis does not form any special sphincter. However, just where the ductus g. i. joins the intestinal wall a sphincter is present, in the form of a circle of muscular fibres, which lie close to the wall of the intestine. But they seem more likely to belong to the muscular sheath of the intestine than to the duct.

As is partly seen already in the schematic figure (text-fig. 13), the ductus genito-intestinalis empties into an intestinal branch. The photographed sections are paramedian, since one of the laterally located false seminal vesicles is found more anteriorly on the same sections. In reality the main gut ends a short distance caudal to the female genital pore and sends out two backward running branches. The main gut does not show any beadlike compressions with muscular sphincters during its course through the pharyngeal as well as the post-pharyngeal zone. Such, however, are always present in the intestinal branches. Thus the ductus genito-intestinalis does not enter the main gut, but, instead, one of the two most posterior intestinal caeca. Therefore, one cannot expect to find the most caudal part of the ductus g. i. on the median sections.

The lumen of the right intestinal branch in which the ductus g. i. terminates is empty. Hence it was a little unexpected to find numerous egg-fragments in the left posterior intestinal branch. As the more unaltered eggs agree very well with those in the uterus both as to size, characteristic appearance, and staining ability of the yolk granules etc., and, as they also lack shells, there can be no doubt but that they originate from the animal itself. It is obvious that they have reached the intestine via the ductus g. i., then travelled forwards into the main gut, and from this gut into the fellow-branch. I have not found any remnant of sperma in the intestinal system, but it is of course plausible, considering the enormous production of sperma in this as in other Polyclads, that superfluous sperma, and particularly that which is not vigorous enough to travel to the uteri, is pressed into the intestinal system of the animal, with the aid of the peristaltic movements of the muscularis of the ductus genito-intestinalis, in order to be assimilated in the alimentary diverticula. The observations mentioned above give evidence that also an absorption of superfluous egg-material takes place.

Comparison with other Stylochid-genera.

Discostylochus agrees in respect to the shape of the body with that characteristic of *Stylochidae*, i. e. the short, wide, oval shape. Likewise the body is thick and firm. The genus differs from *Stylochus*, *Idioplana*, *Idioplanoides*, and *Meixneria* in that the tentacles are decidedly rudimentary, while in this respect it shows a similarity to *Neostylochus* and, though to a less degree, to *Parastylochus* and *Cryptophallus*. *Limnostylochus* is described as lacking tentacles altogether, though tentacular eye groups have been retained. Not even these are found in *Bergendalia*, which also lacks tentacles. The pharynx is not so well developed as is usually the case in *Stylochidae*. It is short, but quite wide through the presence of a few deep side-folds. The nearness of the genital pores to each other is a characteristic that is also common for *Stylochus*, *Idioplana*, *Idioplanoides*, *Neostylochus*, and *Limnostylochus*. The female genital aperture is relatively further away from the posterior margin of the body than in other *Stylochids*, and in this respect the genus probably most resembles *Neostylochus*. The male organization is that typical for *Stylochids*. The prostate ve-

sicle is not as well developed as that of *Stylochus* with its numerous tubes, but resembles that of *Idioplanoides*, *Meixneria*, and particularly that of *Neostylochus*. As a result of its elongated prostate vesicle, *Limnostylochus* occupies a special place within the family. As in *Meixneria*, *Cryptophallus*, and *Parastylochus*, two false seminal vesicles have been developed, while the other *Stylochids* have an unpaired median seminal vesicle, which, in certain *Stylochus*-species and in *Idioplana*, is three-lobed. As in most *Stylochids*, the penis is thick, fleshy, and unarmed. Only *Neostylochus* and *Limnostylochus borneensis* have a penis armed with a stylet. Penis-sheath is absent, as is usually the case in *Stylochids* except in *Meixneria*. In the female apparatus the most marked deviation is the presence of a ductus genito-intestinalis. Regarding its derivation from the duct of Lang's glandular vesicle, see above. Lang's glandular vesicle is present in *Idioplana*, *Neostylochus*, *Idioplanoides*, and *Limnostylochus*, and, in the case of the two mentioned last, it is equipped with a couple of long anteriorly directed diverticula. *Cryptophallus* lacks Lang's glandular vesicle, but has instead a ductus vaginalis which has a joint opening with the vagina. The same condition occurs in *Bergendalia*. The genera *Meixneria*, *Parastylochus*, and *Stylochus* lack every trace of Lang's glandular vesicle. In *Stylochus*, *Parastylochus*, *Cryptophallus*, and *Neostylochus* the vagina is very short, but has the characteristic forward bend that distinguishes the acotylean vagina. In the new genus it is relatively longer.

The genital glands have the usual location, with ovaries dorsally and testes ventrally. Their location has been moved only in certain *Stylochus*-species. The intestinal branches do not anastomose, and have their usual beadlike appearance, as, in all Stylochids, but the main gut has rather few lateral branches.

In regard to the arrangement of the eyes, the new genus holds a middle position with *Stylochus*, *Cryptophallus*, and *Parastylochus* on the one side and *Neostylochus* on the other.

The above discussion shows that without doubt the species in question is a true *Stylochid*, but also that, due to the presence of various features, it would be difficult to classify it with any of the existing genera. It probably approaches *Cryptophallus* the most. This genus has insignificant tentacles, situated far from the anterior end, but close to each other. Extremely numerous marginal eyes

around the entire body and cerebral eyes forming one single oval group, which anteriorly, by means of frontal eyes, connects with the zone of the marginal eyes. The pharyngeal pocket is very long with numerous side-folds and extends so far backwards that it overruns the male organ. Consequently there is a prolonged main gut giving off numerous coeca. For a further comparison I might only add a short resumé of the copulatory organs of *Cryptophallus.* The genital pores are at a great distance from each other with the female aperture about $^1/_{10}$ the length of the body away from the posterior body-margin. There is a pair of false seminal vesicles, a prostate gland of simpler construction, and a short, unarmed penis without penis-fold. The female apparatus with quite a short vagina has a ductus vaginalis. The small male apparatus lies underneath the most posterior part of the pharyngeal pocket (Bock 1913, Text-fig. 13). The two last sentences express the main divergencies.

To the genus *Discostylochus* I give the following diagnosis: Stylochids with the shape of the body rounded oval. Eyes scattered over anterior end with denser clusters across the brain. Small marginal eyes in the praepharyngeal and pharyngeal zone of the body. Distinct tentacular eye-groups underneath rudimentary tentacles. Pharynx short and wide. Genital pores close to each other but at a pronounced distance from the posterior margin of the body. Penis unarmed with ductus ejaculatorius and prostate duct fusing near its apex. Prostate vesicle large, oval, not chambered, far away from penis. Two distinct false seminal vesicles. Vagina of middle length, equipped with a very muscular, expanded ductus genito-intestinalis.

One species from Hawaii.

III.

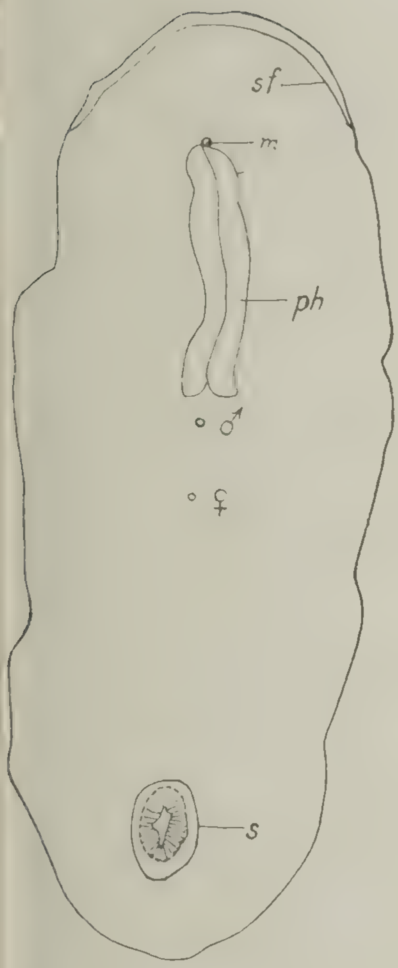
Polyclads living together with the Pagurid Petrochirus californiensis Boucrez.

Among the material brought home from Dr. Mortensen's Pacific-expedition are three specimens of a small Prosthiostomid which in various ways differs from the typical organization of *Prosthiostomum*. There are, as a matter of fact, sufficient reasons for describing it as a new genus. Its biology, moreover, presents a particularly interesting feature. In both localities mentioned below the genus in question was collected in shells inhabited by the Pagurid *Petrochirus californiensis* Boucrez. Several specimens of an Acotylean Polyclad, *Emprosthopharynx opisthoporus* Bock 1913, were also found together with this Pagurid. Thus we are here introduced to new cases of Polyclads associated with other animals. Both of these Polyclad-genera are, consequently, carried around by their host, whose meal they probably also share. Without doubt the species also enjoys splendid protection by living in the shells inhabited by Pagurids. This case shows the particular tendency in Polyclads to crawl into cavities, etc. in order to get away from the light and to seek protection. It is a well-known fact that specimens of *Leptoplanidae* and *Prosthiostomidae* are found in the daytime underneath stones, between the roots of Laminarians etc., to use only a few examples. *Latocestus* shows special skill in crawling into cavities and channels of Lithothamnions, a circumstance that I have had the opportunity to observe on the South Sea coral islands. In this way they at times succeed in baffling even the most earnest collector. Its negative phototropism can undoubtedly be regarded as an excellent means of avoiding danger, that should not be underestimated.

Euprosthiostomum adhaerens n. g. n. sp.

(Plate II a, Figs. 1—4.)

Locality: One specimen collected at a depth of 13 fathoms at Taboguilla Island, Gulf of Panama, November 27, 1915. Two specimens collected at a depth of 5 fathoms on Taboga Island, Gulf of Panama, December 7, 1915.



Text-fig. 14. *Euprosthiostomum adhaerens* n. g. n. sp. The body from the ventral side. 15 x. m, mouth; ph, pharynx; sf, sense furrow; s, sucker.

Habitus: The body of the preserved specimens is somewhat elongated and of nearly even breadth, with its anterior and posterior ends rounded (text-fig. 14). Although decidedly contracted, the largest specimen (from Taboga) measures $6^1/_3$ mm. in length and $3^1/_2$ mm. in breadth. The type specimen from Taboguilla, which is reproduced on Plate II a, Fig. 1, is, as can be seen in the photograph, also very contracted. Therefore, the living animals of this species must, when fully extended, have a length that is 4 or 5 times its breadth. Particularly noteworthy is the wide caudal end, which is not drawn out and tapered, as in the genus *Prosthiostomum*, but rounded, a shape that must be connected with the location of the sucker. None of the specimens show any pattern, but the dorsal epithelium has retained an even slightly brownish colour.

Measurements: The specimen on which the following description is based, and of which I have a complete series of sections, measures in length 5 mm. and in breadth barely 2 mm. The mouth is immediately back of the brain, on a level with the posterior line of the brain; consequently, at the end of the first seventh of the body. The pharynx is one-fourth the length of the body (Plate II a, Fig. 1). The marked caudal location of the very large, oval sucker (Plate II a, Fig. 2, s) is the best characteristic, as until now a similar location is not known for any other Prosthiostomid. The distance from the posterior edge of the sucker to the caudal limit of the body is not even the length of the sucker. The sucker is $^1/_{12}$ the length of the preserved specimen. As the posterior part is hardly

constricted, while that lying anterior to the sucker is in a decided state of contraction, connected as it is with the existence of a very thick ventral inner longitudinal muscular layer, which is lacking in the post-cotylean part, the disproportion between the prae- and post- cotylean section is without doubt much larger in the creeping animal, the relation probably being about 1:20. The disc of the sucker measures 0,5 in length. The sucker has a stem that is short and thick.

Arrangement of eyes: The two cerebral eye-clusters meet anteriorly. Posteriorly they diverge and each cluster consists of

Text-fig. 15. *Euprosthiostomum adhærens.* Arrangement of eyes, 48 x. The four eyes marked black are ventral eyes. The sense furrow is also drawn.

about 10 dorsally located ocelli. Nearer the ventral side of the animal there are two more eyes on the lateral side of each of the clusters mentioned above. These are shown black on text-fig. 15 and belong of course to the cerebral clusters. However, they are on a level with the brain, and not close to the dorsal muscular wall of the body. The openings of their cups are turned toward the ventral side of the body. They represent the ventral eyes mentioned by Lang for a number of Cotylean genera.

The marginal eyes form a half-circular band reaching to the region of the pharynx. In the most anterior part of this region, there are also a couple of scattered ocelli. Between the cerebral and the marginal eyes, on each side of the median line, there are also a few ocelli, which in analogy with the condition in the Acotylean genus *Stylochus*, I shall call frontal eyes. These, as well as

the inner marginal eyes, may be directed forwards, upwards, or backwards, while, on the other hand, the marginal eyes of the outer edge always, as far as I have been able to find in the series of sections, have the opening of the cup turned toward the edge of the margin. This orientation of the cups seems to follow general principles.

The frontal sensory furrow runs near the anterior edge of the body, and reaches the marginal edge of the animal at the level of the brain (text-fig. 14, sf).

Body-wall: The epidermis, which as usual is higher dorsally than ventrally (Plate II a, Fig. 4), is characterized by a noticeable scarcity of rhabditi. Instead, the gland cells, with a fine granular, erythrophile secretion, occur in great numbers. This is particularly the case on the ventral side in a submarginal band, where they are clustered in masses. The cilia are long, but are not densely arranged (Plate II a, Fig. 4). In spite of the contracted state of the animal, which is reflected in the slender shape of the epithelial cells, the cilia may at times reach a greater length than the cell bodies. The basement membrane is thick and has a homogeneous appearance (when preserved in formaldehyde). Except for the thick ventral inner longitudinal muscular layer, which, lateral to the median line, exceeds all the other layers together in thickness, the muscularis of the body is rather thin. But its fibres are very coarse. Dorso-ventral musculature has average development. Parenchymatous tissue not abundant.

Sucker: The epithelium of the disc of the sucker is more than three times as high as the ventral epidermis. With its enormous mass of secretion (from subdermal glands) and total lack of cilia, it presents a striking contrast to the epithelium devoid of secretion in the stem, where the ciliated cells show only ordinary height. Already in the stem of the sucker the basement membrane is as thin as a line, and it was not possible to trace it on the adhesive disc with the staining technic used. It stands to reason that this unusually developed sucker would have a particularly robust and stout musculature, and this can easily be traced back to where it to a great extent originates from the ventral inner longitudinal muscular layer. It must also be pointed out that the latter does not reoccur caudal to the sucker. The sucker contains

in addition thick bundles of dorso-ventral muscular fibres. A considerable number of secretory ducts from the surrounding body-section traverses the thick stem on their way to the adhesive disc. The secretion is very fine-granular and erythrophile, and is formed in gland cells situated in the parenchyma, but only ventrally to the intestinal coeca. The abundance of secretion that is taken to the adhesive disc shows what an important rôle it plays in the function of the sucker.

The great size of the sucker deserves special notice. If one, in order to get a good measurement for comparison, uses the relations between the size of the sucker and that of the brain, the two are found, in the case of *Prosthiostomum*, to be of about the same size. But in *Euprosthiostomum* the length of the sucker exceeds the greatest diameter of the brain many times. On account of the great contractibility of the body, I do not consider the relation, length of sucker: length of body very practical for comparative purposes. That follows indirectly from the remarks on page 50.

I have no doubt but that the splendid development of the sucker must be connected with the peculiar habits of the animal, being an adaptation for the life as intruder. I only wish to remind the reader of the *Bdelloura* species inhabiting *Limulus*. Their sucker is quite a new acquirement, as the free-living *Tricladida maricola* are devoid of such an organ. As a Cotylean Polyclad *Euprosthiostomum* possessed a sucker already before taking up its stay in the houses of the Hermit crabs. The displacement of the sucker to the posterior end of the body I am also inclined to regard as a result of altered living conditions and as of direct value for the animal. The genus *Bdelloura* just mentioned, as well as ectoparasitic Trematods, have a sucker, and suckers respectively, located at the hinder end of the body. Thus, in this Prosthiostomid, while the sucker retains its hold to the substratum, the area for collection of food is increased, in comparison with other members of the family, where it is subcentrally located. It might further be pointed out that the feeding range is increased to a considerable degree through its possession of a tubular pharynx, which undoubtedly can be protruded and prolonged in the way characteristic of other Prosthiostomids. How efficient this organ is in *Prosthiostomum* in obtaining food, how excellent it works as pump mechanism, and how far it can be

prolonged, I have had rich opportunities to observe during my journeys in the Pacific.

Summarizing, one would say that the increase in size and specialization, as well as the changed location of the sucker, is considered as an accommodation to the new modus of living acquired by this Polyclad through its stay with Pagurids.

Digestive apparatus: This resembles in the main that described by Lang for *Prosthiostomum siphunculus.* From the mouth a narrow tube runs upwards and backwards and with a wide free brim enters the foremost part of the pharyngeal pocket. The pharyngeal pocket is of considerable size, reaching dorsally and ventrally almost to the muscular wall of the body, separated from it only by very insignificant parenchymatous tissue (Plate II a, Fig. 3). It is further noticeable that inner longitudinal muscular fibres of the ventral muscle wall of the body are practically lacking in the pharyngeal zone. The pharynx has the organization typical for Prosthiostomids, but connects with a special lip-development with the spacious and wide main gut which is situated exclusively back of it. This kind of diaphragm can be observed on Plate II a, Figs. 3 and 4. The main gut reaches caudally even as far as the sucker. The intestinal epithelium is remarkably low, and contains, as in the case of all Prosthiostomids, masses of Minot's granular gland cells. These agree very well with those shown on the figure that Lang has given of *Pr. siphunculus.* The outer bulging part of the gland cell is developed as a secretory cup, while the basal half of the cell is narrow and filled with a compact, homogeneous-looking plasma stained deeply with hematoxylin. In the lumen of the main gut is a coagulation of partly digested nutriment as well as secretion from Minot's granular gland cells. The series of sections show clearly that the digestive process is begun here; thus the partly digested liquid mass of food-matter can later be distributed to the intestinal coeca in spite of their narrow lumen. The thick epithelium of the intestinal diverticula differs greatly from that of the main gut. The cells form a veritable syncytium, and as is clearly visible in the sections, this is packed with nutritive substance; hence we have here a typical picture of intracellular digestion at work. Large round balls of a mass stained with eosin indicate the presence of albuminous elements, which, together with the

spaces left by fat now extracted by alcohol and real nutritive vacuoles, agree with the observations that I have made on living intestinal cells in other Cotylean Polyclads. Minot's granular gland cells are totally absent in the intestinal coeca. Therefore the preparations make it very probable that the function of Minot's granular secretion is to transfer the nutriment in such a condition that it can easily be distributed to the coeca, where it is finally assimilated through intracellular absorption. Thus the main gut in this case takes the part of a stomach; i. e. a spacious receptacle for the initial preparation of the food pumped in by the pharynx. After disaggregation the food can then be delivered to the diverticula for intracellular digestion. I might here only mention that Westblad (1922) takes another standpoint in the case of Minot's gland cells.

As in *Prosthiostomum*, there are numerous intestinal branches from the sides of the main gut. No anastomosis has been observed in the lateral parts of the body.

A remarkably short, but wide, unpaired intestinal branch arises from the anterior end of the main gut, and is slightly inserted over the pharyngeal pocket, where it very soon ends blindly (Plate II a, Fig. 4, ia). This is the very rudimentary, insignificant remnant of the common, unpaired anterior intestinal branch of the Polyclads. Such a branch occurs fully developed in *Prosthiostomum.* The degeneration in the case of *Euprosthiostomum* is due to the fact that the wide pharyngeal pocket has appropriated all the space available inside the muscular wall of the body.

When thus the rudimentary anterior unpaired intestinal branch does not continue over the pharyngeal pocket, one would not expect to find any intestinal diverticula running over the brain. However, in *Euprosthiostomum* a very narrow median intestinal branch occurs. It arises from a transverse anastomosis between the most anterior pair of intestinal coeca immediately in front of the pharyngeal pocket. This then compensates for the reduction of that part of the normal unpaired intestinal branch that lies over the pharyngeal pocket. Consequently, the more anterior section of the unpaired median intestinal diverticle, which is after all the one important for the supply of nutriment and oxygen to the brain, still remains.

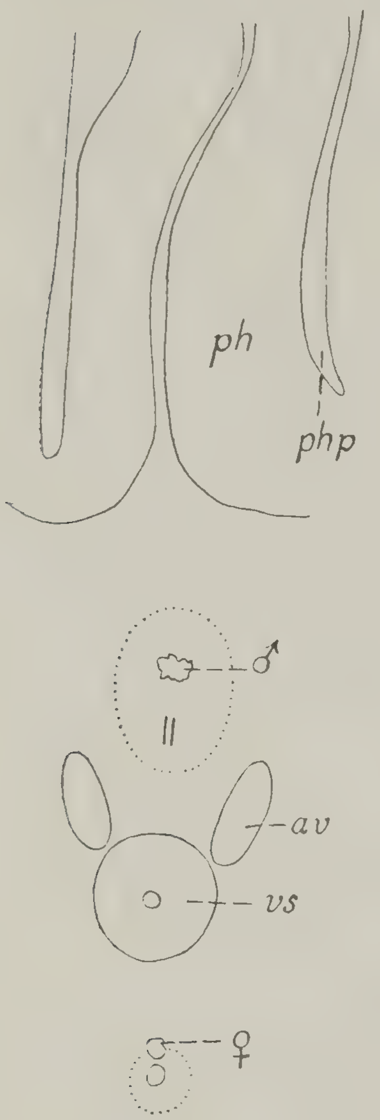
G e n i t a l o r g a n s: The ovaries lie as usually dorsally, the

testes ventrally, and during maturity the former may be inserted between the intestinal coeca. Neither kind occurs in any great numbers. Figure 1, Plate II a, shows the distribution of the ovaries in the body. The series of sections show that ovaries are absent in the prae-pharyngeal as well as the most posterior section of the body, and, as they are also lacking above and close to the pharynx and the main gut, they have become clustered in two more laterally located longitudinal fields. They cease at quite a distance from the lateral margin of the body. Thus the female genital glands show a remarkable concentration, while that for the testes is even more marked. These, as a matter of fact, do not reach, neither rostrally nor caudally, as far as do the female glands. Moreover, as they are never compactly arranged, we find here a modification in the sexual production uncommon in Polyclads. However, this reduction is not so extreme as that present in some minor Cotyleans from Antarctis: *Enterogonimus, Stylochoides, Leptoteredra*, and especially *Laidlawia,* in which the ovaries through their production of large eggs have been considerably reduced in number. The same feature; i. e. a reduction in the number of ovaries due to the increase in size of the eggs, also characterizes the exceedingly small *Chromoplana* and *Amyella* from Japan (Bock, 1922). In *Euprosthiostomum*, on the other hand, the eggs are both relatively and absolutely rather below the average size and the ovaries small, and thus the reduction in the number of ovaries cannot be explained as in the above-mentioned species. The testes do not seem to have undergone any very distinct reduction in number in the species enumerated above.

The male apparatus agrees distinctly in its general characteristics with that typical for *Prosthiostomum.* Lang has given such an extensive and careful description of it in the case of *Pr. siphunculus* that I shall merely deal with the differences present and refer to the text-figures 16 and 17 and Plate II a, Fig. 4.

From the male genital pore, situated immediately back of the level of the insertion of the pharynx, the antrum masculinum runs in a backward-upward direction; in *Pr. siphunculus*, on the other hand, it goes forward-upward. Lang has considered that the latter direction argues in favour of self-fertilization, but this has, however, not yet been proved. The stylet of the penis of the species under

consideration is, consequently, when in an inactive position, directed slightly forward, although the hook-shape of the fleshy part of the penis characteristic for all Prosthiostomids is well marked. The penis stylet is only 120 μ long and reaches its maximum width, 6 μ, in its middle part where its walls are thick. Towards the apex it becomes as thin as a line. The lumen of the stylet was filled with prostatic secretion. In its distal half the sheath of the penis is equipped all around with a high prostate epithelium and underlying embedded gland cells as in the genus *Prosthiostomum*. Only in *Pr. lineatum* Meixner does the secretory epithelium form a caudal half-circle.



Text-fig. 16. *Euprosthiostomum adhærens.* Middle part of a specimen, cleared in cedar-wood oil. In ventral aspect. 88x. av, accessory vesicles of the male apparatus, ph, pharynx; php, pharyngeal pocket; vs, vesicula seminalis.

The two muscular accessory vesicles show pronounced deviation from the general type. They are very small (text-fig. 16), and have a club shape, in direct contrast to the large, spherical, and exceedingly muscular vesicles of the *Prosthiostomum*-species. The thin muscular wall (measuring only 8 μ in thickness) does not, as is usually the case, contain any nuclei in the fibrous layer. The efferent duct is here only a direct continuation of the vesicle. The muscular envelope of the vesicle merges into the musculature of the duct; the muscularis diminishes in thickness and at the same time the longitudinal fibres of the vesicle gradually disappear. In the *Prosthiostomum*-species, on the other hand, the efferent ducts, enveloped by their own special muscular covering, pierce the thick muscular wall of the vesicle. Whereas the efferent ducts in the *Prosthiostomum*-species are long and coiling,*) they are in the present case very short and almost straight.

The seminal vesicle is, when seen from the ventral side, circular

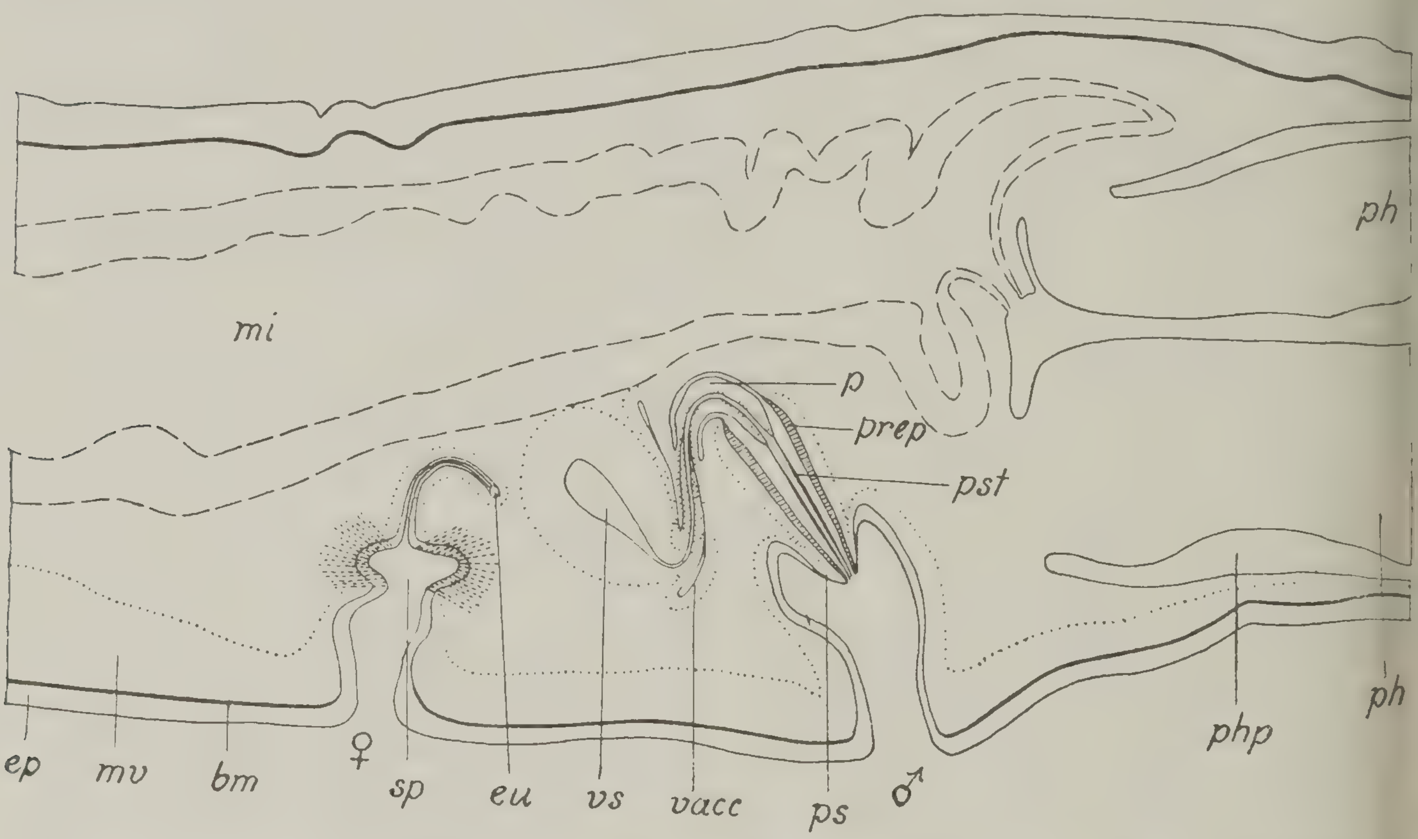
*) *Pr. singulare* Laidlaw 1904 is claimed to have „accessory vesicles" relatively small and their ducts short. This species is supposed to lack cerebral eyes!

but in median sagittal sections egg-shaped with its narrower end directed forward. The ductus ejaculatorius has a muscular wall not much thicker and only a little wider than the efferent ducts of the accessory vesicles. A peculiar fact is that the two seminal canals open into the fronto-lateral part of the vesicle. As a result, one finds three tubelike cavities lined with epithelium, so that the lumen of the vesicle assumes the shape of a fork with three prongs, the middle of which continues as the ductus ejaculatorius. Each large seminal canal is expanded nearest the seminal vesicle and equipped with an exceedingly sparse epithelium. This short part is directed forward. At a distinct boundary the epithelium then changes both appearance and function. It is now made up of high, wide cells, and some of these contain a large, round, homogeneous corpuscle that stains with eosin. Such an albuminous coagulation, during the life of the animal in form of drops, has clearly a nutritive function and is emptied into the lumen of the seminal canal. Accordingly we find here numerous scattered „drops" or even large masses of them together with sperma. The latter are extremely short and often arranged in bundles. I must necessarily point out that the coagulations in the large seminal canals resemble so greatly in their appearance the large round contents of the intestinal cells that I am unable to distinguish between them with the aid of the microscope.

Text-fig. 17 shows the female genital apparatus. The forward direction of the proximal part is an unusual feature. In this respect we find an agreement with *Enchiridium*. *Prosthiostomum*-species, as well as other Cotyleans, have usually a vagina curved caudalwards. *Pr. pulchrum* Bock, *lineatum* Meixner, and *angustum* Bock, form a series of transitory types from the ordinary Cotylean type of vagina (e. g. in *Pr. siphunculus*) to the one in question, which thus is a secondary manifestation. The caudal direction of the proximal part of the vagina is otherwise a feature practically general for the anatomy of Polyclads. Even such Acotylean Polyclads whose female gonopore is situated near the posterior margin of the body present such a feature. This shows with what amazing tenacity certain apparently unimportant characteristics manage to be retained. As far as I can ascertain, *Stylochocestus gracilis* Laidlaw 1904 is, if Laidlaw's figure really is accurate, the only exception

to the rule in the case of the Acotyleans. In regard to *Idioplana*, I refer to my remarks in the paper of this series published next.

The transversal efferent ducts from the uteri run to the anterior part of the vagina. Each uterus has a long caudally directed as well as a short anterior limb. Oviducts run from the dorsal part of the body down to the uteri, entering them on their dorsal side.



Text-fig. 17. *Euprosthiostomum adhaerens*. Schematic diagram of the genital apparatus: the figure being combined from several sagittal sections through the middle part of the body. 72 x.

bm, basement membrane; ep, epidermis; eu, entrance of the uteri into the vagina; mi, main intestine, from which projects anteriorwards the rudimentary unpaired gut branch; mv, muscle wall of the body (the dotted line is the interior limit of it); p, fleshy penis; ph, pharynx: php, pharyngeal pocket; prep, epithelium with granular glands; ps, penis sheath; pst, penis stylet; vacc, accessory vesicle of the male apparatus (the other lies above the seminal vesicle); vs, vesicula seminalis.

Discussion of the new genus: As yet the family *Prosthiostomidae* Lang 1884 contains only two genera: *Prosthiostomum* Quatrefages 1845 and *Enchiridium* Bock 1913. The former has a world-wide distribution in warm and temperate waters and contains many species. Lang included two anatomically examined species and six Stimpson's species from Hongkong and Japan as well as one doubtful species, *pellucidum* (Grube). 7 more species were described between 1884 and 1912 (see Bock, 1913, p. 283), and then 2 new ones from the Bahama Islands (Bock 1913) and 4

new ones from Japan together with *Pr. grande* Stimpson (Yeri & Kaburaki, 1918 and 1920). *Enchiridium* contains only one species, *E. periommatum* Bock from the West Indies.

All the *Prosthiostomum*-species that have been closely examined agree anatomically very well with *Pr. siphunculus* (Delle Chiaje) described so extensively by Lang. The genital organization shows particular agreement with the type, and the diagrams and descriptions given verify the pronounced homogeneity. There are also other features of the organization so far known that indicate that all the species are closely related. As the species under consideration differs from the *Prosthiostomum*-species known to date, precisely in those characteristics that are, as far as we know, common to them all, I feel that it would be premature to rank it with the same genus as these. In order to stress the very close relationship with the genus mentioned, I have called the new genus *Euprosthiostomum*. I wish particularly to emphasize that the raising of the new species to generic rank is based less on the importance of the differentiated characteristics than on the fact that the characteristics of *Prosthiostomum* have been found to be common to a considerable number of species. The system should show the direct mutual connection between species. Therefore, it would certainly be out of the question to introduce into a genus as homogeneous as *Prosthiostomum* an element so different as the new species.

The feature in the new form that particularly catches one's eye is the location of the sucker relatively near the caudal end of the body; it is therefore at quite a distance from the centrally located female gonopore. In the *Prosthiostomum*-species, on the other hand, we find the sucker just back of the female pore, in or near the median point of the ventral side. It is only in *Pr. pulchrum* Bock, that one can speak of any noticeable backward displacement and it is then in direct connection with the removal of the genital pores from the vicinity of the pharynx. In *Enchiridium* the sucker lies anterior to the median point of the body, likewise close to the female opening. The unusual development, as well as the remarkable change in location of the sucker, must be connected with the animal's way of living, which has already been treated above. Although a splendid characteristic for species, it would, nevertheless, in itself be insufficient as reason for

separating the species from the genus *Prosthiostomum*. On the other hand, I must attach greater importance to the dissimilarity in the genital organs and especially to the fact that the pair of accessory vesicles in the male copulatory apparatus has an organization different from that indicated in *Prosthiostomum*. In so doing I wish to refer the reader to the above description and call to mind the fact that these organs show absolute conformity in all the *Prosthiostomum*-species that have been more closely examined. This is also the case in the many new species of *Prosthiostomum* from the Pacific which I shall describe elsewhere. It is only necessary to add here that *Enchiridium* shows an entirely different course of development as regards these vesicles. They have here, as a matter of fact, become one single organ through having a joint muscular envelope, but *Euprosthiostomum* shows its relationsship to the *Prosthiostomum*-type through the spherical shape of this vesicle, as it were, and through the condition of the efferent ducts.

The absence of an unpaired intestinal branch over the pharynx in this new genus reminds one of a similar differentiation in the genus *Stylostomum* of the family *Euryleptidae*. Lang (1884, p, 140) describes the latter feature as follows: „In einem Punkte weicht der Gastrovascularapparat von *Stylostomum* von der aller übrigen Polycladen ab. Vom vorderen Ende des Hauptdarmes bis zum Gehirn, also in der Gegend des Pharynx und des männlichen Begattungsapparates existiert kein vorderer medianer Darmast“. The intestinal branch over the brain in *Euprosthiostomum* arises, as a matter of fact, in the same way as in *Stylostomum*; i. e. from the anastomosis between the most anterior pair of intestinal branches. Thus we have here a case of congruent development, dependent on the same factor: the remarkable increase in size of the pharyngeal pocket. In this connection I might call to mind the case of another Euryleptid, *Aceros baeckstroemi* Bock 1923 a, from Juan Fernandez, which has evaded the difficulty arisen through the increased size of the pharyngeal pocket by moving the unpaired anterior intestinal diverticle to the side of the pharynx.

Besides the differentiations mentioned, there are also others, such as, the reduction in the number of genital glands and their absence in the most anterior and most posterior parts of the body, the organization of the seminal vesicle, the forward curve of the

vagina, and the presence of frontal eyes. The two last mentioned are, however, not valid in all cases. As far as I know, only *Pr. awaënse* Yeri & Kaburaki 1918 of the described *Prosthiostomum*-species has eyes between the cerebral and marginal eye clusters. As regards vagina, see above. *Enchiridium* is the only Prosthiostomid that has eyes along the entire margin of the body. The new genus, which is placed in the immediate neighbourbood of *Prosthiostomum*, is diagnosed as follows:

Prosthiostomids with marginal eyes only in the anterior region of the body and frontal eyes. No gut branch above the pharyngeal pocket. The two separate accessory vesicles of the male apparatus small, club-shaped, with short efferent ducts forming the direct continuation of the vesicle. The proximal part of the vagina directed forwards. Sucker at a decided distance from the female gonopore and situated near the posterior margin of the body.

One species from Panama, living associated with Pagurids.

Emprosthopharynx opisthoporus Bock 1913.

(Plate II a. Fig. 5—7.)

Locality: Panama, Taboguilla. In the houses of the large Pagurid *Petrochirus californiensis* Boucrez.
Sandbottom.
Panama, Taboga. Also with the same Pagurid species.
Depth ca. 9 m.

Material: In the collection there are in all not less than 8 specimens, three of them taken Nov. 27th and the others Dec. 7th, 1915, at the last mentioned locality.

It is of interest to receive more material of this species, as the original description (Bock 1913) was founded on a single specimen. This was obtained by the Swedish Eugenie Expedition visiting the Galapagos Islands in 1852. Its relationship to other Acotyleans is not yet clear. I may here mention that a second species, an extremely minute one, was collected by me in the Gilbert Islands in 1917. The presence of eyes arranged parallelly in respect to the body margin made me rank the genus among the

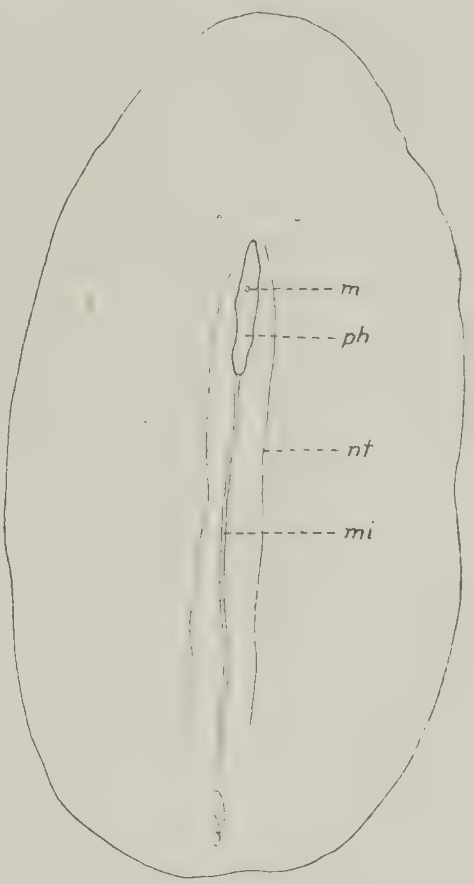
Craspedommata Bock 1913, but these eyes are not strictly typical marginal eyes, as they do not as usual follow the margin closely. The position of the pharynx immediately behind the brain, thus confined to the anterior part of the body, is quite atypical for an Acotylean. This feature is still more pronounced in the Gilbertean species, the pharynx being extremely short, showing a tubular form. Thus the pharynx of the new species approaches the type acquired by the Euryleptids among the *Cotylea*, a rather interesting case of parallel evolution.

Dr. Mortensen's collection has afforded an increased knowledge as to the living habits of *Emprosthopharynx opisthoporus.* No notes accompanied the specimen of the Eugenie-Expedition. But it is not improbable, that just an occurrence with a Pagurid might have caused that attention was paid to it and it was conclusively preserved. Turbellarians were otherwise not collected during this expedition.

On Plate II a, Fig. 7, I give a reproduction of the body-shape of one of the animals collected by Dr. Mortensen. Usually the specimens are elongated oval, but sometimes they show a nearly rounded outline. Without exceptions the specimens are all devoid of body pigmentation. In preserved state they have a milk- to cream-colour.

The largest specimen measures 19 mm in length and 8 mm in breadth, the smallest $5^1/_2$ and 3 mm respectively. On simply an ocular examination it is impossible to detect any tentacles. However, with the help of the microscope I succeeded to barely guess at the presence of tentacular rudiments in a couple of individuals. In an animal cut in a series of longitudinal sections they are, however, so undeveloped that they are hardly identifiable. Fig. 5 on Plate II a represents a photograph of a section through the tentacular region. There is no difficulty to recognize this by means of the tentacular eyes, which are far more superficially located than the others. It is clearly visible on the photograph reproduced how the greater part of the dorsal muscle wall is discontinuous in the tentacular region, leaving a sufficient space for the group of tentacular eyes. It is rather remarkable that n o n e o f t h e s e e y e s o c c u r b e l o w t h e l i n e drawn as continuation of the interior limit of the dorsal muscle wall of the body. The dense

clustering of the eyes, the distinctness of the group, the superficial location of the eyes, and their larger size afford full security as to homologization of these eyes with the tentacular eyes of other Acotyleans. The conclusion can then be safely drawn that the Acotylean type of tentacles, i. e. nuchal tentacles, originally belonged to *Emprosthopharynx*. To-day it is merely expressed in the interruption of the muscular wall and the retaining of the superficial location of the tentacular eyes.



Text-fig. 18. *Emprosthopharynx opisthoporus* Bock. Outline of a specimen, with pharynx, main intestine, large ventral nerve trunks, and tentacular groups of eyes indicated.

It is a common feature that the tentacles or the tentacular area, when the tentacles disappear, are nearly totally devoid of gland cells in the epidermis. Thus the tentacular epidermis shows usually a striking contrast to the ordinary gland-bearing epidermis of the body. This distinguishing feature is, however, of little value here, as the whole dorsal body surface is rather poor as to glands. The demarcation of the tentacular rudiments of *Emprosthopharynx* in the epidermis is thus less apparent, as a glance at the photograph mentioned will prove.

Epidermis. The dorsal epidermis is certainly lower than the ventral one, but the difference in height is never considerable. Through the preservation the epithelial cells are somewhat shrunken and thus slightly isolated from one another. This condition affords excellent, clear images of the cellular elements in the epidermis. It verifies my earlier description of the epidermis of the Polyclads. The supporting cells (= „Deckzellen") exceed to a very great degree all other kinds in the dorsal epithelium. On the ventral side the gland cells producing rhabdites occur in extremely great numbers. They are absent in the adhesive zone, which receives rhabdites from the parenchyma (cf. Bock 1913, pag. 163). The large nuclei, rich in chromatine, reach half the length of the cell-body. Their shape (rounded to oval) depends on the contraction state of the muscular wall of the body, as the height and breadth of the cells

are influenced by it, as is clearly visible on the sections through different parts of the body.

Of special interest is that there is a transformed outer layer in each of these supporting cells. The substance forming it, a metaplasmatic product, is, even at the strongest magnification, homogeneous and it imbibes easily with staining agents. With iron hematoxylin it attains an appearance similar to that of a cuticle. Such a layer, extremely rare in the Polyclads, is described for a great many other Turbellarians (f. i. Alloeocoeles) and has verbally been called a cuticle, a name which I shall not adopt, as I find it not adequate. At a cellular height of 15—20 μ and a breadth of 6 μ this metaplasmatic layer is little more than 2 μ thick.

Outside of it are basal corpuscles of the cilia and through it the „Cilienwurzeln" pass and continue further downwards through the protoplasma of the cell.

Most of the epidermal gland cells produce rhabdites. The cyanophile secretion is formed in the subdermal glands and their ductuli pierce the body-wall of the ventral side.

Another feature of yet greater importance for the knowledge of the epidermis of the Polyclads is the occurrence of a kind of adhesive cells. There was, of course, no possibility to study them in the type specimen from Galapagos from the middle of the 19th century. These cells distinguish themselves very clearly from all other epithelial cells both in cytological structure and in location. They are strictly limited to the submarginal zone and there they form a nearly circumferential band leaving the anterior end more or less free. The band is broadest at the posterior end, but at the sides of the body reaches at least 500 μ in breadth. No ordinarily ciliated supporting cells occur in these submarginal zones and no ordinary gland cells. The secretion, rhabdites, acido- and cyanophile secretion is received from gland cells in the parenchyma.

Lang has especially looked for adhesive cells in Polyclads, but with negative result in respect to fullgrown animals. He says thus (1884, pag. 57): „Auch auf Schnitten habe ich nie Elemente im Epithel angetroffen, die ich hätte auf Klebzellen beziehen können; ich weiss übrigens von der Untersuchung von *Gunda segmentata**)

*) Identical with *Procerodes lobata.*

her, dass sie auf Schnitten kaum aufgefunden werden können." My own experience in respect to *Procerodes* and other marine Triclads is just the opposite to Lang's, as I have had no difficulty to get the most brilliant preparations, using the sectional method after fixation with sublimate. The same is evidently the case for Böhmig and Wilhelmi, judging from the figures presented by them.

In very young Leptoplanids living pelagically Lang (l. c.) observed cells „mit höckeriger Oberfläche", which, not without reason, he regards as adhesive cells. According to him, they occur all over the ventral surface.

As in *Tricladida maricola*, the adhesive cells of *Emprosthopharynx* are arranged in a submarginal band and occur in no other part of the body. In this broad area formed by them, there are, to repeat the fact, no ordinary supporting cells, the adhesive cells alone constituting it. Secretion occurring between the cells is conveyed to the epithelium from subdermal gland cells, rhabdites as well as cyanophile secretion. The former might be distinguished from the ordinary rhabdites of epidermal origin only through their somewhat smaller size.

The adhesive zone stands out perfectly clear through the characteristic content of the cells, the rods mentioned below, and through the fact that the surface is covered by very short, straight, hairlike projections. The cells are perhaps somewhat higher than the supporting cells of the adjacent area. The two former circumstances called my attention to them, as well as to the very conspicuons feature of a rich amount of subdermal gland cells in the marginal zone of the body.

The nucleus is located in the basal half of the cell, interpreted as adhesive organ. The exterior half of the cell presents the striking feature of parallely arranged, thick rods, strongly stainable with iron hematoxylin. These perpendicular rods reach the surface of the cell-body. Many of them might be followed to the base of the cell and have also been observed to continue in the strings of secretion passing from the parenchyma through the muscularis and basement membrane. While the conditions are very clear in the exterior part of the cells, it is, owing to the fixation, somewhat obscure in the basal part, not allowing one to definitively state how in detail the secretion is distributed to all the numerous channels in

the plasma of the exterior half of the cells. Transverse sections allow accurate counting of the secretion rods in the outer part of the cell. As a rule their number is 12 to 15. Often they are arranged in transverse rows. Empty channels have actually been discerned, but they of course allow no safe counting and are, as a rule, rare.

The fine rods of secretion are also stainable with eosin in hematoxylin-eosin preparations, with orange G and picrie acid, when used together with Fuchsin S, and with Safranin in combination with Lichtgrün. On the use of oil immersion a granular arrangement in the rods is often visible. These rods of the adhesive cells but rarely pass beyond the level of the cell-body. This is a rather astonishing fact, but is perhaps attributable to preservation conditions.

I have devoted much time to decide definitively the true nature of the projecting „hairs" on the cell surface. They are several times coarser than the cilia of the supporting cells of the ordinary epidermis but their length is less than a fourth of that of the cilia. Absolutely contrary to the cilia, which are bent and twisted, having suffered in the fixation, they always have a straight course. In iron hematoxylin-Fuchsin S preparations they attain a strong tint of red. Counted on transverse section through the epidermis, their number is only slightly more than the number of secretion rods. I have tried in vain to definitively convince myself of the tubular nature of these „cilia"-like projections. The minuteness of these formations is a serious hindrance in obtaining full security in the interpretation. Empty rings are, however, never observed. On transverse sections of them a lustrous glaring core and a delicate „bark" are traceable. When the rods of secretion are seen to pass beyond the cells, they just reach the outer level of these formations. It has, of course, not been possible to ascertain with full security an actual covering of the projecting secretion. But Fuchsin S or Lichtgrün produces an effect, which makes it appear so. I have not been able to trace beyond doubts the direct continuation of the thick rods into the thinner processes ejecting from the surface of the cell, but it seems to me very probable. Owing to the delicateness of the structures, it is an extremely difficult test. A slight touch or a pressure on the tube of the microscope during

these trials is to be preferred to even the slightest movement of the micrometer screw. It seems then not implausible that a connection really exists. I am thus disposed to assume that, being then widened the hairlike formation may act as outlets for the secretion. For a positive statement, however, new, and still better preserved material is necessary.

Even if in cytological respect the real nature of the hair-like formations is not clear beyond doubts, there is hardly any doubt that by means of the secretion these cells function as adhesive organs. Having studied the adhesive cells of the *Tricladida maricola*, I have not the least hesitation in rejecting the interpretation given by Wilhelmi in his important work: Tricladen in „Fauna und Flora von Neapel“ and I must give full support to the view latest held by von Graff in Bronn (Tricladida), that the secretion passing through the adhesive cells really plays the role of adhesive substance. Watching a triclad fastened to the substratum and beginning to free itself before creeping starts, one becomes convinced that the visible muscular contraction detaches the animal from the substratum.

It is true that the gatherings of coarse, clubshaped projections from the adhesive cells of Triclads are impressive formations, beside which the secretion rods of the *Emprosthopharynx* are rather diminutive, but for both kinds of cells it is valid that the secretion from gland cells in the parenchyma pierces the plasma of the adhesive cell.

Lacking a sucker, *Emprostopharynx* has consequently as a substitute the submarginal band of adhesive cells. To judge from the conditions in marine Triclads such a band might act excellently for its purpose. The broadness of the band, compared with that of marine Triclads, is noteworthy, even when regard is taken to the difference in size of body. The latter might more than counterbalance a possible disfavour in respect to effectiveness of the individual cells in the Polyclad.

The existence of this means of adhering must be of advantage to an animal taking up its abode with such an active creature as a Pagurid. But it might be mentioned that corresponding adhesive cells occur in the new species of *Emprostopharynx* from Gilbert Island (Apemama). This was found free-living. Being of an extremely

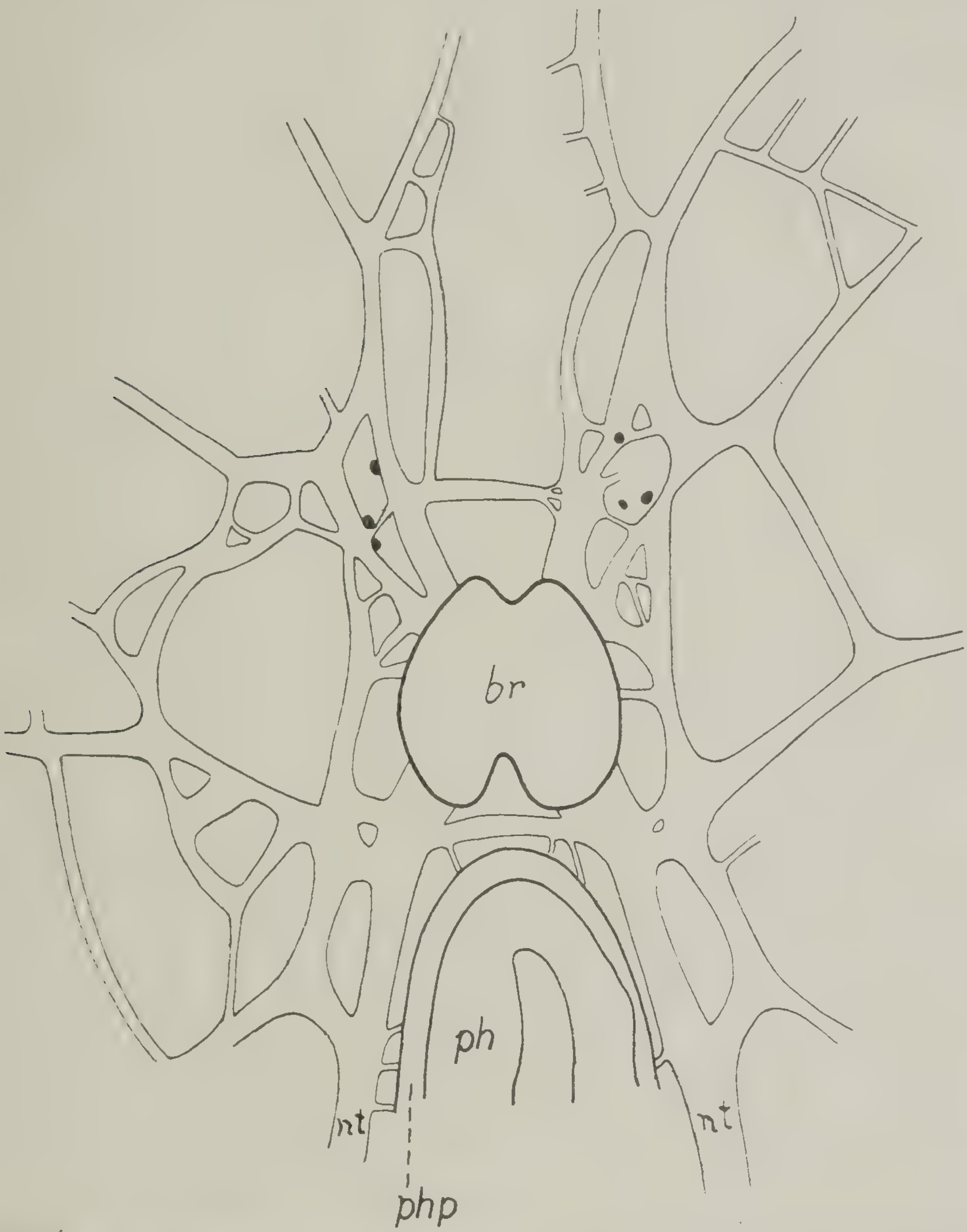
small size (only 3 mm at fullest sexual maturity) for a Polyclad the number of adhesive cells is inconsiderable. Occurring exclusively near the margin of the body, they appear isolated among supporting cells and only to a number of 4 or 5 on a section. Consequently we have here more resemblance to *Procerodes* conditions. The augmentation of the adhesive zone in *E. opisthoporus* may easily be regarded as a special adaptation to the association with the Pagurid.

In regard to the muscular wall, which shows the usual arrangement of layers, I have definitely observed the presence of fine transverse fibres immediately below the basement membrane. On horizontal sections these are easy to observe, on others the use of oil immersion is necessary.

A far better preserved material has made it possible to study the alimentary and genital system in detail, but I shall make the discussion brief, giving only a few supplementary notes to the earlier description. A comparison between the type specimen from Galapagos and Dr. Mortensen's material shows a divergency in respect to the pharynx. The side pockets of the pharyngeal chamber in the former are nearly absent in the latter, as seen in text-figure 21. With regard to the location of the pharynx and mouth as well as to the absence of a wall protruding into the pharyngeal chamber from the surroundings of the mouth, there is full agreement in both cases. The thin, much convoluted pharyngeal fold of the type specimen deviates somewhat from the thick, less folded one in the new specimens. I cannot attach any greater importance to that difference, which perhaps, to a large extent, may be due to preservation.

The intestine deserves special attention, as the material allows a chance to rectify the earlier description. The main gut reaches into the region of the genital apparatus. It shows the peculiar condition of dorsal and ventral pouches in an extremely dense arrangement. They predominate to such extent that the main gut does not assume the usual character of a tube, but of a series of hollow beads. They are so large that they fill up the available space inside the muscularis of the body, in dorso-ventral direction. This circumstance as well as the very bad preservation of the alimentary system has hidden the extension of the mid gut in the type specimen. Know-

ledge of the true conditions has made it possible to disclose the same features on a renewed, laborious examination of the oblique longitudinal sections of the type specimen. The side branches project in a large number and „ihre bedeutende dorsoventrale Aus-



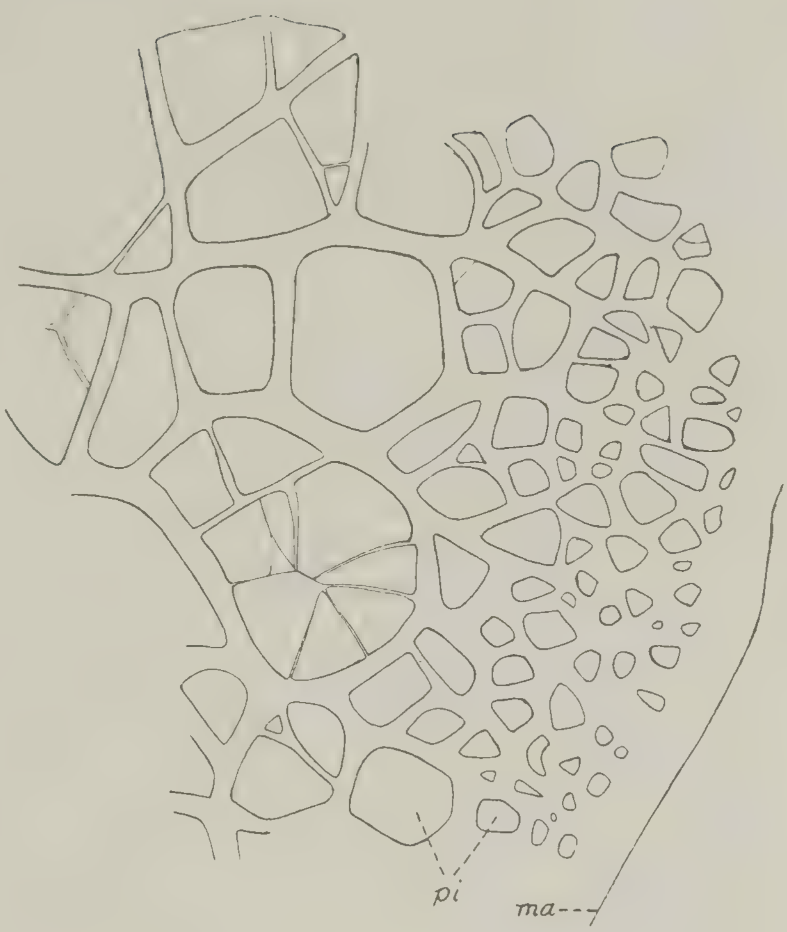
Text-fig. 19. *Emprosthopharynx opisthoporus.* Brain (br) and ventral nerves projecting from it. The black dots are ventral cerebral eyes. ph, pharynx; php, pharyngeal pocket.

dehnung“ previously noted, and their dense gatherings make the alimentary system the most preponderant one observed by me in any Acotylean Polyclad. On horizontal sections scarcely anything but intestine is visible, interrupted by bundles of very coarse dorso-ventral fibres; also on longitudinal sections the mass of the intestine is overwhelming. This depends to a great extent upon two facts. Firstly, in all sectioned animals gonads were in un-

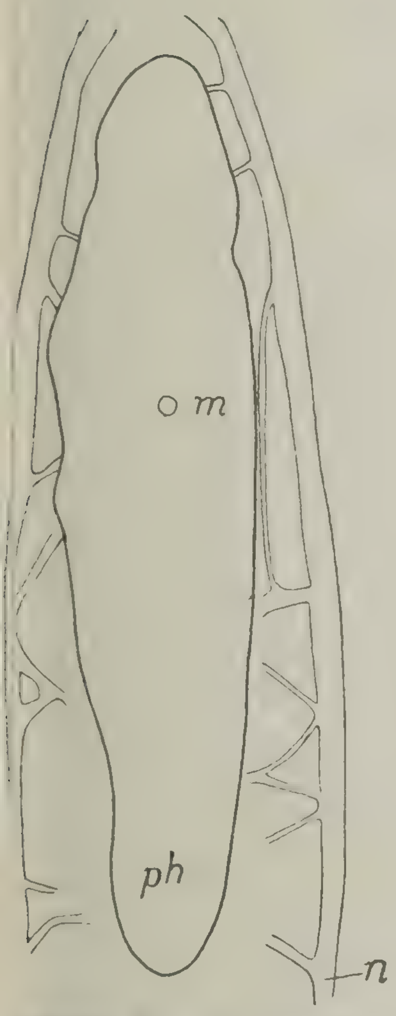
developed state, and, secondly, the animal was in excellent nutrimental condition. The lumen, as well as the syncytical wall, abounds with yolk material. It must have been derived from rather tremendous quantities of eggs. It is then rather easy to assume that these animals are not innocent guests of their hosts, but unfortunately the digestive work is too far gone to allow safe conclusions as to the source of the eggs. It is of interest to mention that also the type specimen presented conditions in the alimentary system rather similar to the new ones. Beyond doubts one must take into account the extremely ferocious nature of the Polyclads when judging the state of things as to the nature of the livelihood of these animals in relation to their hosts.

An extensive treatment of the nervous system will be spared for a later paper dealing generally with the conditions in *Acotylea*. The brain belongs to the bi-lobed type (Text-fig. 19) and has an extremely ventral position immediately above the muscular wall. It has already been stated (Bock 1913, p. 164) that the sensorial ganglions outside the capsula cerebralis (Lang's „Körnerhaufen") are small. It may be added here that a substitute therefore exists inside the capsula in the antero-lateral part of the brain, on both sides, in the form of a greater collection of sensorial ganglion cells of the typical appearance, with small nuclei rich in chromatin characteristic for the prae-cerebral ganglions. The large motorial ganglion cells of the brain extend on the sides, dorsally, ventrally, and laterally; the giant motorial cells are confined to the posterior half of the brain. Text-fig. 19 reproduces a drawing of the ventral nerves proceeding from the brain. They very soon anastomose richly with one another. The dorsal nerves have as usual a narrow calibre. The two large posterior ventral nerve trunks stand out perfectly even so far back as in the region of the genital apparatus, which they furnish with nerves (text-fig. 22). To give an idea about the rich anastomosing net-work of nerves I present two figures of the ventral nerve net (Plate II a, Fig. 6 and text-fig. 20). The more the periphery of the body is approached, the more the nerves subdivide and anastomose. Consequently the interspaces between the nerves are much smaller near the margin than farther away from it. Text-fig. 20 shows that this condition is gradually reached. A closer study of horizontal sections gives evidence that

ıere is a veritable zone of ıervous cells. This circum-pheral nervous system must ıe of considerable importance. At the margin there is also ıs usual a great mass of embryonic cells, as the growth of the body continues from ıere. The differentiation of uch embryonic cells into nuscle cells and other body issue can here be studied. The nerves of the dorsal side, lso forming a network, have nuch smaller calibre than the entral ones.



Text-fig. 20. *Emprosthopharynx opisthoporus.* Ventrally situated nerve net at the side of the body, near the posterior end. ma, margin of the body; pi. interspaces between the anastomosing nerves.

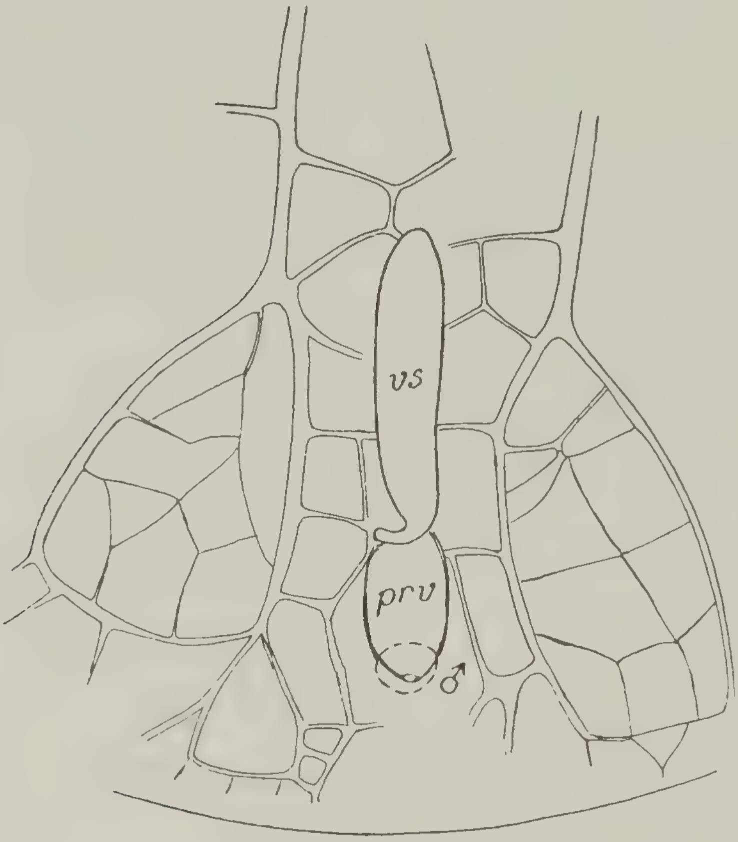


ext-fig. 21. *Emprosthopharynx opisthoporus.* Nerve net around the ıarynx. m. mouth; n, rge ventral nerve trunk; ph. pharynx.

It is perhaps superfluous to directly state that there is no discrete annular nerve along the body, (= „Ringnerv") as in this respect text-figures 20 and 22 are clear enough. Furthermore, a study of the sections support this statement. Lang mentions that on transverse sections of *Anonymus virilis* Lang, he has obtained an impression of the occurrence of a „ringförmiger Randnerv" and deplores the fact that he has not been able to decide it positively. He was aware of the occurrence of such a nerve in the Triclads, and has consequently made his utmost to detect a corresponding nerve in the Polyclads, but with no success in other species.

In the anastomosing network of the dorsal and ventral side, *Emprosthopharynx* shows the same general type as that found by me in other Polyclads. The stronger ventral nerve net in several Polyclads

has been figured by Lang (1884, Taf. 31), Heath (1907), and Heath and Mc Gregor (1912), and my own experience stretches over most of the Polycladidean families. All these investigations point in the same direction, that such a discrete marginal nerve is lacking. A kind of substitute for it might be found only in the density of the network along the border, but the nerve branches are at the same time more narrow.



Text-fig. 22. *Emprosthopharynx opisthoporus.* Nerve net around the male apparatus. prv, vesicula granulorum; vs, vesicula seminalis.

In the genital system I was not able to detect any clear difference from the type specimen. It might only be added to the previous description (Bock 1913, pp. 165-166) that in the prostatic vesicle the glandular layer has an even contour and is consequently unfolded. It reaches the same thickness as the muscular envelope. There is only one kind of secretion in the intra- as well as extracapsular glands. The granules are of uniform and extreme fineness and imbibe feebly with eosin, attaining a dull pink tint. Thus the second kind of glands producing a large-granular, intensively stainable secretion is absent. Just at the proximal part of this vesicula granulorum the lumen is widened, the lining epithelium being low and glandless. In a number of Acotyleans (e. g. *Stylochus*-species, *Cryptocelis ijimai* Bock 1923) the interior wall of the vesicula granulorum is differentiated into a low glandless epithelium at the lumen and a basal layer of accumulated bodies of gland cells. No trace of such differentiation occurs here.

The male genital apparatus of *Emprosthopharynx* undoubtedly resembles in structure that of the genus *Cestoplana*, even if certain differences as in the presence or absence of penis-sheeth, occur. In both genera the vesicula granulorum opens by means of a duct

provided with heavy muscular envelope in the proximal end of the prostatic vesicle. But it is to be noted that the orientation of the male apparatus is just the opposite in them. In *Cestoplana* it lies, as Lang particularly emphasizes, behind the male opening, demonstrating in this respect agreement with the Cotylean type and disagreement with the ordinary conditions among Acotylea. The presence of a kind of adhesive organ at the extreme end of the body in *Cestoplana* is then worthy of some attention. However, we lack information as to its structure. Lang, giving no details in this respect, says only: „Ich vermuthe, dass hier Klebzellen vorkommen". Marking it first sn on Taf. 15, Fig. 1 (derived from „Saugnapf"), he has evidently later taken a more cautious standpoint, as in the explanation of the plate he used the term „Haftorgan". How much it might resemble the sucker of the Cotyleans is yet unknown but supposedly not to any great degree. In itself the sucker is not of very great importance as proof for relationship, as such organs might be acquired independently, but in combination with other features it might be of value. But *Cestoplana* is of a rather indifferent type. In the case of tentacles, a valuable characteristic in the Polyclads, there is no trace of such formations, neither nuchal as in *Acotylea* nor marginal as in *Cotylea*. The arrangement of the eyes hardly gives us points of appui and the same is more or less true in the other organization.

Recently (1922) Frieda Meyer has described a *Cestoplana polypora* from the Red Sea. The most interesting feature in this Polyclad is undoubtedly the multiplication of the female apparatus. These organs occur behind one another in the median line of the body and their number vary from 5—30. Referring to my discussion on *Polyposthia* (1913), the authoress says: „Wenn Sixten Bock sagt, dass Multipla von Begattungsapparaten durch Spaltung eines einzigen Apparates zu erklären ist. . . , warum sollte die gleiche Annahme nicht für den weiblichen Apparat gültig sein. Sonst würde ja bei den von mir untersuchten Tieren den weiblichen Geschlechtsapparat ganz fehlen". In her paper is related a notice received in a letter from Dr. Stummer-Traunfels on a case of duplicity of female apparatus as well as of sucker in a specimen of *Thysanozoon brochi*. Both these data give the necessary support for a similar interpretation of the postgenital vesicles of *Cryptocelis Ijimai* Bock

1923. When I wrote my paper on this remarkable form, the description of *Cestoplana polypora* was not yet published, and unfortunately it remained unknown to me until 1924. Without presenting more facts in support, I would not then (l. c. page 31) give my explanation, but I emphasized strongly the nature of the glands carrying their secretion to the vesicles. „In all essential points the glands closely resemble the shell glands surrounding the vagina". The derivation of the vesicles from a splitted or multiplied first beginning of the female apparatus was less evident as they had globe shape, and, no analogous examples being recorded, this could consequently be doubted by the reader. Now in *Cestoplana polypora* the case is clear and convincing in itself, as the organs agree with one another. The multiplication of the female apparatus is there too apparent to be doubted. That there must exist connections with the uteri is beyond doubt, though not actually detected. Already in 1913 (page 249) I pointed out that *Cestoplana* in respect to male and female apparatus shows resemblance to *Emprosthopharynx*, as well as to the more primitive type among *Leptoplanidae.* As I have also pointed out, disagreements as well are present. A discussion as to eventual relationship of *Emprosthopharynx* to *Cryptocelidae* (*Microcelis*) was also carried out (l. c. pag. 166). I can hardly say that the knowledge of the Acotyleans has increased so much that we are yet able to trace the actual relationship of this aberrant genus to other families.

The relation of the two Polyclads to their host.

There remains to be taken into consideration the kind of association that these Polyclads have with their host, *Petrochirus californiensis* Boucrez. The time has passed when every animal found intimately associated with another and living on its surface was uncritically regarded as a real ectoparasite. What is then the meaning of parasitism? In 1906 Max Brown defined parasites as living organisms which for the purpose of obtaining food take up their abode, temporarily or permanently, on or within other living organisms. Though a general agreement is scarcely to be expected in respect to such a vague category as parasitism, the restriction, for the purpose of obtaining food from the host, seems quite necessary. To the definition I would also add

that forms interpreted as parasites must show definite specialization to their new modus of living. The term parasitism must necessarily remain somewhat elastic, as, in respect to habits, the categories are created in our mind, in Nature they are fluent. Descending from free-living ancestors, the parasites have by degrees evolved their parasitism. Under such circumstances there are always forms which present intermediate stages. In using the words true parasites, I shall take as starting-point that in ordinary life the animals, firstly, are wholly dependent upon the food they receive from the host, secondly, that they clearly show adaptations for their stay on the host.

These introductory remarks serve only the purpose of fixing my standpoint for the present case, and are therefore cut brief.

True parasitism is in this sense unknown in the Polyclads. Several forms are, however, on the way to evolve it, but only the initial steps have as yet been taken. I might here refer to the enumeration of such Polyclads in the first chapter of this paper. In other Turbellarian groups there are nice series of examples of intimate relation to the host (v. Graff 1903, Wahl 1906-1910, Beklemicheff 1915, Caullery et Mesnil 1903, etc.). The most advanced adaptation occurs in the Rhabdocoeles (f. i. *Fecampia*) and Acoeles. Far more bound to the host than any Polyclad are, for instance, *Bdelloura* species among the Triclads, not to speak of the group Temnocephaloidea. In the Polyclads the dependence upon the host is evidently very slight, and they would be able to carry on their life even if compelled to leave their host. There would scarcely be any other difference than that they would have lost the eventual protective value of the stay and the struggle for food would be somewhat augmented during a completely free-living state. Recognized clearly, this demands that the question of true parasitism must be left out of consideration in the present case. If I were to make a supposition as to the relation of the Polyclads to their hosts, it would be that *Hoploplana inquilina* (Wheeler) on the Gastropod *Sycotypus canaliculatus* Gill and the Pagurid Polyclads described here are more intimately associated with their hosts than other known Polyclads.

A case parallel to the two latter ones is mentioned in the literature, inasmuch as it refers to a Polyclad living with Pagurids.

Verrill (1893) has described a *Stylochus zebra* and notes that all his specimens collected off New Haven, Conn., were found in the canals of dead shells of *Fulgur*, that were occupied by *Eupagurus pollicaris*. Other specimens taken in Vineyard Sound were living in the same manner.

Wheeler (1894) presents the following notes: „Possibly *Stylochus zebra*, Verrill, may be somewhat parasitic. This beautiful species is not uncommon at Woods Hole in the dead shell of *Lunatia heros* tenanted by hermit crabs and invested with Hydractinia. Whether the planarian merely selects the *Lunatia* shell as a hiding-place or bears some definite relation to the hermit crab, I am unable to decide". v. Graff 1903 says with regard to this species: „bietet aber nichts in ihrer Organisation, was als Folge ihrer eigentümlichen Lebensweise zu deuten wäre. Wenn dieser nicht von den Frassabfällen profitiert, so wäre zunächst daran zu denken, dass vielleicht der hier abgesetzte Laich besser geschützt sei, als in anderen Lokalitäten". This latter supposition is, in my opinion, hardly acceptable, as such a condition would probably have been recognized by the observers, and we know further that *Hoploplana inquilina* leaves its host for the deposits of eggs (Surface 1907). *St. zebra*, though being a *Stylochus*, has a rather elongated shape. The anterior location of the pharynx and its relative shortness are also unusual for a *Stylochus*. The same is valid for the situation of the mouth in front of the centre of the pharyngeal pocket. A *Stylochus* species with the mouth in the first third of the body deviates apparently from the common type. This moving of the mouth is perhaps a result of its stay with the Pagurids. As to the finer structures of this species, we are rather unacquainted.

In the two species treated here are some features which may possibly be interpreted as established in connection with the association with the hermit crab.

It has already been pointed out with regard to *Euprosthiostomum* that the sucker has been enlarged and also removed to the posterior end of the body, while in other Prosthiostomids it is more or less subcentrally placed. This increase in the power of attachment, as well as the altered location of the sucker, is of clear advantage during the new modus of life. In *Emprosthopharynx opisthoporus* the adhesive zone is regarded as a kind of substitute

for a lacking sucker, and, as mentioned above, it is widened at the hinder end of the body. Furthermore, in the latter species the pharynx begins immediately behind the brain, a striking feature for an Acotylean Polyclad. I regard this as a veritable dislocation of benefit for the collection of food. The small size of the pharynx is another remarkable feature. With the knowledge of the common type of a large folded pharynx in the Acotylea, one is entitled to speak of a direct reduction, when it here has a very small dimension. Through its stay with Pagurids, the problem of acquiring food has been solved in an expedient way and thus brought simplification of the prehensile organ. A striking contrast to the reduced pharynx is the gigantic development of the intestinal system. Inside the muscle wall and nerve net, the body is nearly completely filled up with stout intestinal canals, producing the strongest impression of its working capacity. The intestine demonstrates clearly the excellent nutritive state of the animals; I cannot remember having seen such enormous development of the intestine in any other Acotylean Polyclad.

The genital system of my specimens of *Emprosthopharynx opisthoporus* also affords a noteworthy feature. Taking into consideration the sizes and the complete copulatory organs of the specimens, one is rather astonished to observe the undeveloped state of the gonads. The ovaries are so young that it is really a very difficult task to recognize them among masses of young stages of glandular cells. Though the seminal canals, as well as the vesicula seminalis, carry sperma, the testes are extremely small, having on the sections usually only 10—20 cells. These conditions may have the simple explanation that the collection of the specimens were made before the season of reproduction of this species had set in, as all the specimens agree in having extremely undeveloped ovaries. It is, however, not impossible that this condition bears upon the circumstance that the specimens leave the host at a comparatively early time for the purpose of carrying out the reproduction. I admit readily that the facts are not at all conclusive, and I would not have made the hint if I had not seen my Gilbertean species of the same genus. It presents, in spite of its minuteness, the most striking contrast in regard to the gonads to *E. opisthoporus*. The gonads seem there to have actually supplanted the intestine,

having attained an overwhelming development. Reaching from the dorsal to the ventral muscularis, the ovaries have compressed the intestinal branches to flattened dorso-ventral pouches, approaching an appearance of septa between the gonads. This species was found free-living. Is the reason for this fact only the circumstance that the species just in this state carries out its reproductive duties and is an epoek in youth? The pharynx, also relatively more insignificant than in any other Polyclad, denies it not. For the present the suggestions made have no great value but may serve only as an eventual working hypothesis.

Returning to the two Polyclads associated with *Petrochirus*, we might further discuss the mutual relation between the guests and the host. It is not very likely that the intruders prove injurious to the host itself. My general knowledge of the feeding habits of the Polyclads seems to speak against such an assumption, and the sucking power of the pharynx is scarcely able to get the upper hand over the cuticle-protected tail-end of the host. Only if this is occasionally damaged could the Polyclad be expected to go to an offensive. Bearing upon this subject, there is mentioned a case in the literature. Lesson (1830) describes a *Planaria velellae* [see Lang 1884, page 607; according to v. Graff (1892) identical with the pelagical *Planocera pellucida*] and states that „cette planaire s'attache au vélelles, dont elle dèvore la partie charnue". Also Graeffe has found it on Velella (v. Graff 1903). Cotyleans may often damage Ascidians (e. g. Crozier 1917 on *Pseudoceros*). They appear then as robbers (cf. v. Graff 1903, p. 40). And the extreme robber nature of the Polyclads, of which I have personally numerous examples, cannot be doubted. This makes it not unlikely that the intruders would play havoc among egg collections of the host. In several instances, in yet undescribed Polyclads, I have found the alimentary system abounding with large eggs of other animals, e. g. *Notoplana* species in Japan. The occurrence of large quantities of egg-material in the intestine of *Emprosthopharynx opisthoporus* has already been related. This species is perhaps not always an innocent guest.

The purpose of the stay is to get shelter. Negative phototropism is a common feature in the Polyclads. A search for concealment might have been the driving force when they took up their

abode here. That they also take part in their host's meal is quite easy to assume, as Polyclads are readily fed with pieces of flesh. Thus I have watched *Prosthiostomum* species feeding. That the two species in question have been firmly established is no wonder when the host provides c o v e r, p r o t e c t i o n, and f o o d.

Are these small robbers of any advantage to the host? Possibly as a kind of scavenger, for a hunt on small creatures and a consumption of decomposing animal stuff. Such a point of view would bring them in the category of commensalism, the term taken in its proper sense. The classical example of this is taken just from a Hermit Crab, *Eupagurus bernhardus* with *Actinia adamsi*. Being to a large extent limited to a theoretical discussion, the question thus cannot be definitively decided. But the case is too interesting to be passed by and, for the Polyclads, it has never previously been treated at any length.

Summarizing I think we are on the safe side to assume that these Polyclads belong to the category of synoecism („Synoecie" of German authors) and to exclude true parasitism. The damage done to the host through partaking of the food, devouring flesh fragments, can hardly be regarded as serious and can consequently be neglected. Of quite another importance is undoubtedly a possible robbery of eggs and embryos. That the modus of life that these Polyclads have started may by degrees evolve into a true parasitism is not excluded. At least *Euprosthiostomum* is not without weapon, possessing a penis-stylet. In soft tissues such an organ inflicts wounds, as proved in many instances for the Cotyleans. For the present case I think it powerless, lacking sufficient strength to pierce the cuticle-covered tail-end of the host. Direct observations on the habits of these Polyclads would certainly be of interest and their ferocious robber-nature would then undoubtedly be proved.

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Explanation of the Plates.

Plate I.

Fig. 1. *Ceratoplana colobocentroti n. g. n. sp.* from Krakatau. Dorsal view of animal. The pigmentation belongs to muscular wall and parenchyma. 9x.

Fig. 1a. Ventral view of the same animal.

Ceratoplana colobocentroti var. hawaiiensis n. var.

Fig. 2—9.

Fig. 2 and 3. Dorsal and ventral views respectively of a specimen in alcohol. Tentacles show the natural shape. 3.4 x.

Fig. 4. The same specimen in cedar-wood oil. 6 x. The bi-lobed brain clearly visible.

Fig. 5 and 6. Dorsal and ventral views respectively of another specimen, which has the pharynx protruded through the mouth.

Fig. 7 and 8. Ventral and dorsal views respectively of a third specimen with strongly contracted tentacles.

Fig. 9. The same specimen, transparent in cedar-wood oil. Pharynx appears as a black band and the tentacles as black dots.

Plate II.

Discostylochus parcus n. g. n. sp.

Explanation of lettering:

de, ductus ejaculatorius.
dgi, ductus genito-intestinalis.
e, entrance of the ductus g. i. in the intestine.
ep, epithelium of the ductus g. i.
fvs, false seminal vesicle.
i, intestinal branch.
md, muscularis of the ductus genito-intestinalis.
mi, main gut of the intestine.

ph, pharynx.
pp, pharyngeal pocket.
pre, epithelium of the prostate vesicle.
prm, muscularis of the prostate vesicle.
s, shell glands.
sp, sperma ejaculated into the efferent duct of the vesicula seminalis.
sph, sphincter fibre of the intestinal branch.
u, uterus.

Fig. 1. Anterior part of the animal in cedar-wood oil.

Fig 2. Part of the longitudinal section through the body to demonstrate the vesicula granulorum.

Fig. 3. Part of a longitudinal section to show one of the false seminal vesicles with its heavy muscular envelope.

Fig. 4. The section demonstrates the hinder part of the ductus genito-intestinalis with its entrance into the intestine. Owing to its curve, the epithelial tube of the ductus g. i. is cut twice in the section.

Fig. 5. The photogram demonstrates in greater enlargement how the ductus g. i. pierces the wall of the intestine. The section is next to the one represented on Fig. 4. Around the entrance of the duct the intestinal wall is remarkably thin.

Plate II a.

Explanation of lettering.

a, antrum masculinum.
bm, basement membrane of the body.
f, fissure caused by the sectioning.
ia, unpaired anterior branch of the intestine.
lm, ventral inner longitudinal muscle layer.
mi, main intestine.
ms, muscle wall of the body.
n, nerve.
o, ovary.
p, fleshy penis.
ph, pharynx.
php, pharyngeal pocket.
t, the hardly detectable rudiment of a tentacle.
te, testis.
s, sucker.
ss, shell sac of the vagina.
vacc, accessory vesicle of the male apparatus.
vs, vesicula seminalis.

Euprosthiostomum adhaerens n. g. n. sp.

Figs. 1—4.

Fig. 1. The type specimen cleared in cedar-wood oil. Dorsal side upwards. $15^1/_2$ x.

Fig. 2. The same specimen in alcohol from below to demonstrate the sucker which is provided with a thick stem.

Fig. 3. Longitudinal section through the hinder part of the pharynx. To the left above the antrum masculinum the stylet of the penis is visible. An accidental fissure, f, on this section, between the basement membrane and muscle wall of the body. It continues into the short unpaired anterior branch of the intestine.

Fig. 4. Longitudinal section through the sexual apparatus. The upper part of the vagina, i. e. the part above the shell sac (ss), bends somewhat sidewards and consequently does not appear in this section. Only one of the two accessory vesicles of the male apparatus is present in the section. In the penis the penis canal is visible. Above the short anterior gut branch is an accidental fissure.

Emprosthopharynx opisthoporus Bock 1913.

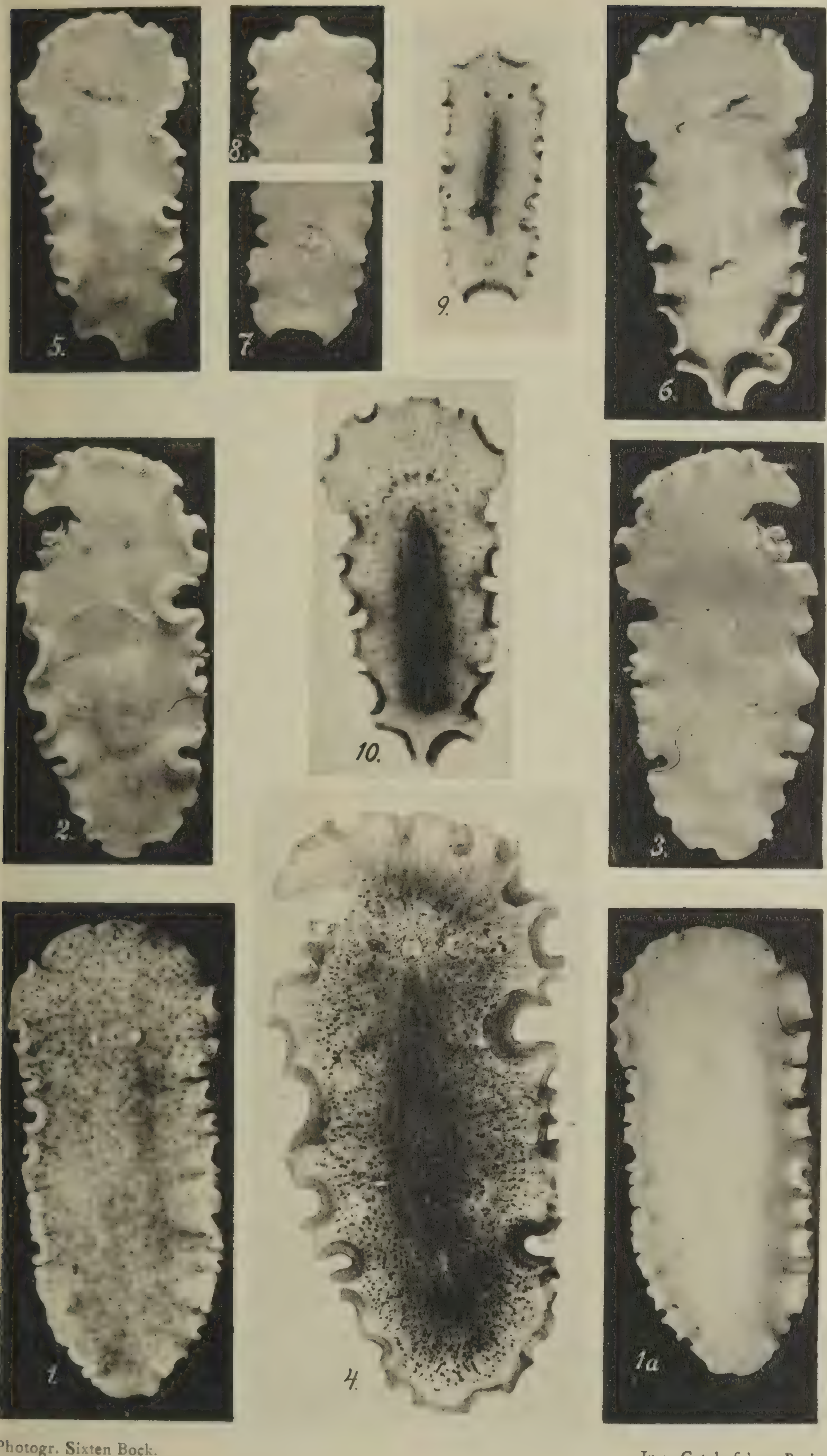
Figs. 5—7.

Fig. 5. Part of a longitudinal section demonstrating the superficial location of the tentacular eyes. It ought further to be observed that the muscle layers of the body wall disappear below the very insignificant prominence corresponding to a rudimentary tentacle.

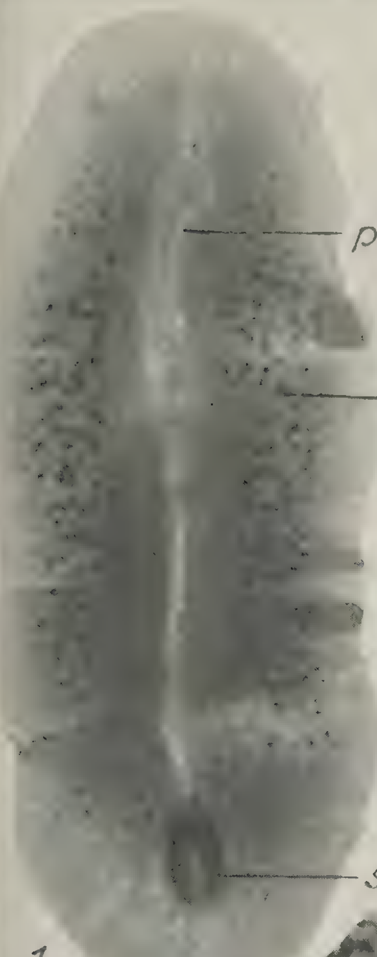
Fig. 6. Lateral part of the body showing the nerve-net. Animal made transparent in cedar-wood oil.

Fig. 7. One of the specimens in alcohol.

20.V.25.



Photogr. Sixten Bock.
Imp. Catala frères, Paris.



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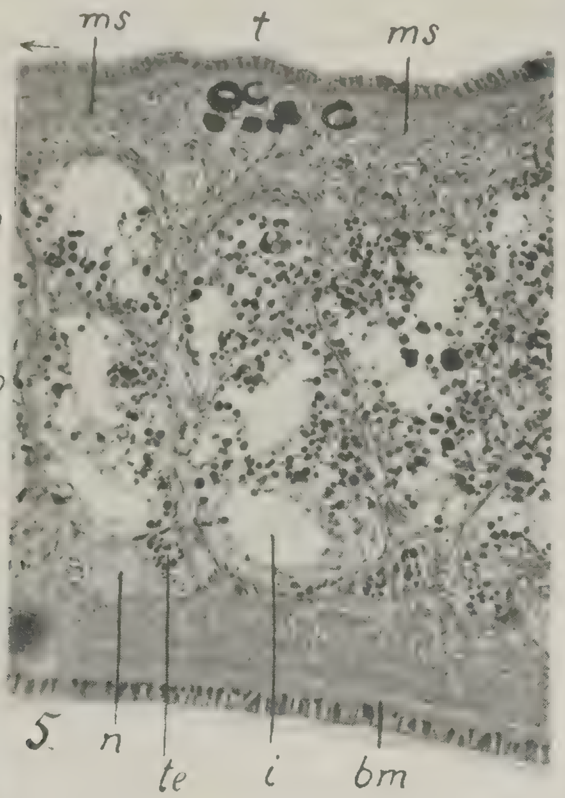

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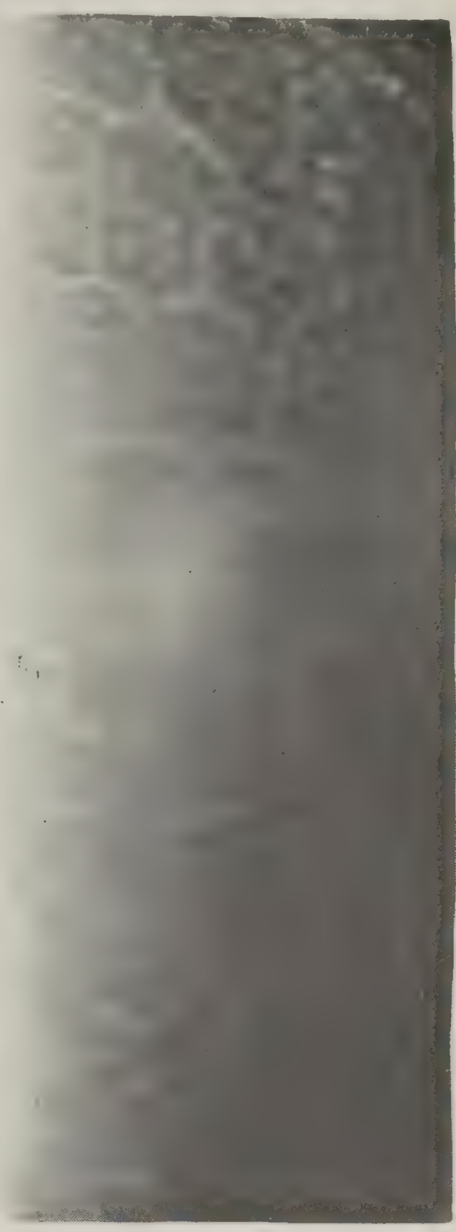

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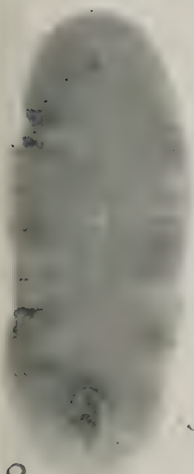

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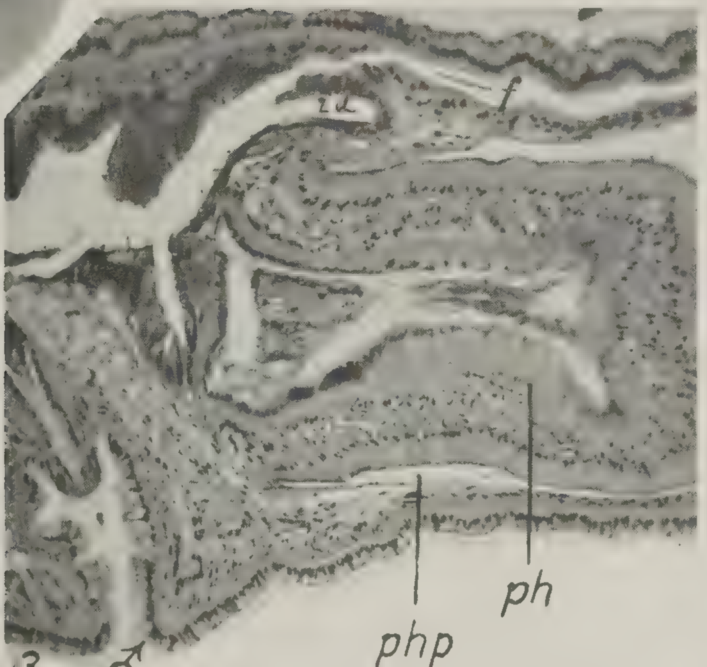

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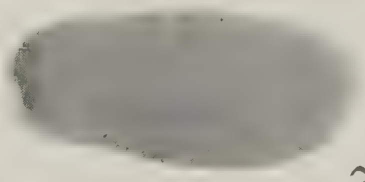

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4.

Papers from Dr. Th. Mortensen's Pacific Expedition 1914—16.

XXVI.

Two new stalked Crinoids from the Kei Islands.

By
Dr. **Torsten Gislén.**

During a visit to the Zoological Museum of Copenhagen in December 1924 Dr. Mortensen exhibited to me the wonderfully rich and beautiful collections of Echinoderms which he has brought together during his numerous journeys in foreign seas. Among other things he showed me also some Crinoids from his last expedition, brought home from the Kei Islands. Two of the stalked Crinoids at once struck me as new, and Dr. Mortensen immediately offered me to study and describe them, an offer which I was delighted to accept, and for which I beg here to express my best thanks. I am also indebted to him for the 3 photos, Figs. 22, 1—3, which he has kindly presented to me.

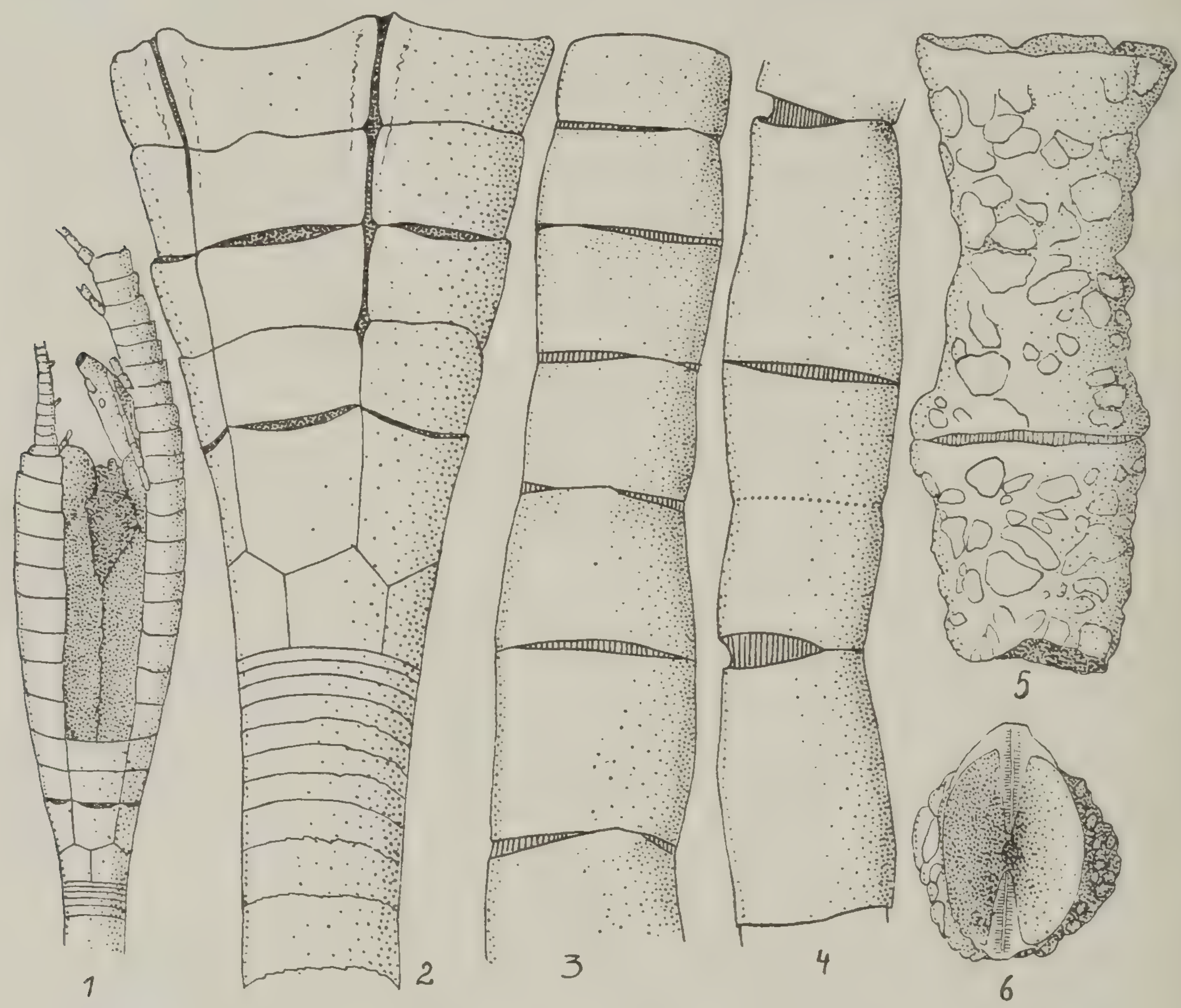
As I shall show below one of these Crinoids was still more interesting than I suspected at a first glance. I have therefore been forced to create a new genus for this singular type. But the second Crinoid also presents several curious features, giving it a very characteristic appearance, distinct from all other species of *Democrinus* in which genus I have ranged the new species.

Porphyrocrinus verrucosus n. gen. n. sp.

Figs. 1—18; 22. 1—2.

Stem with about 86 segments, the 30 most distal being covered by a characteristic calcareous granulation by which the articulations get somewhat obscured. Total length of the stem 255 mm. The 9 most proximal segments very short and discoidal, from the 10th increasing in length, the 15th about squarish. Longest segments $L = 1^3/_4 - 2 \times$ br. About 10 of the most proximal columnals evidently connected by a close synostosis, slowly transforming into a

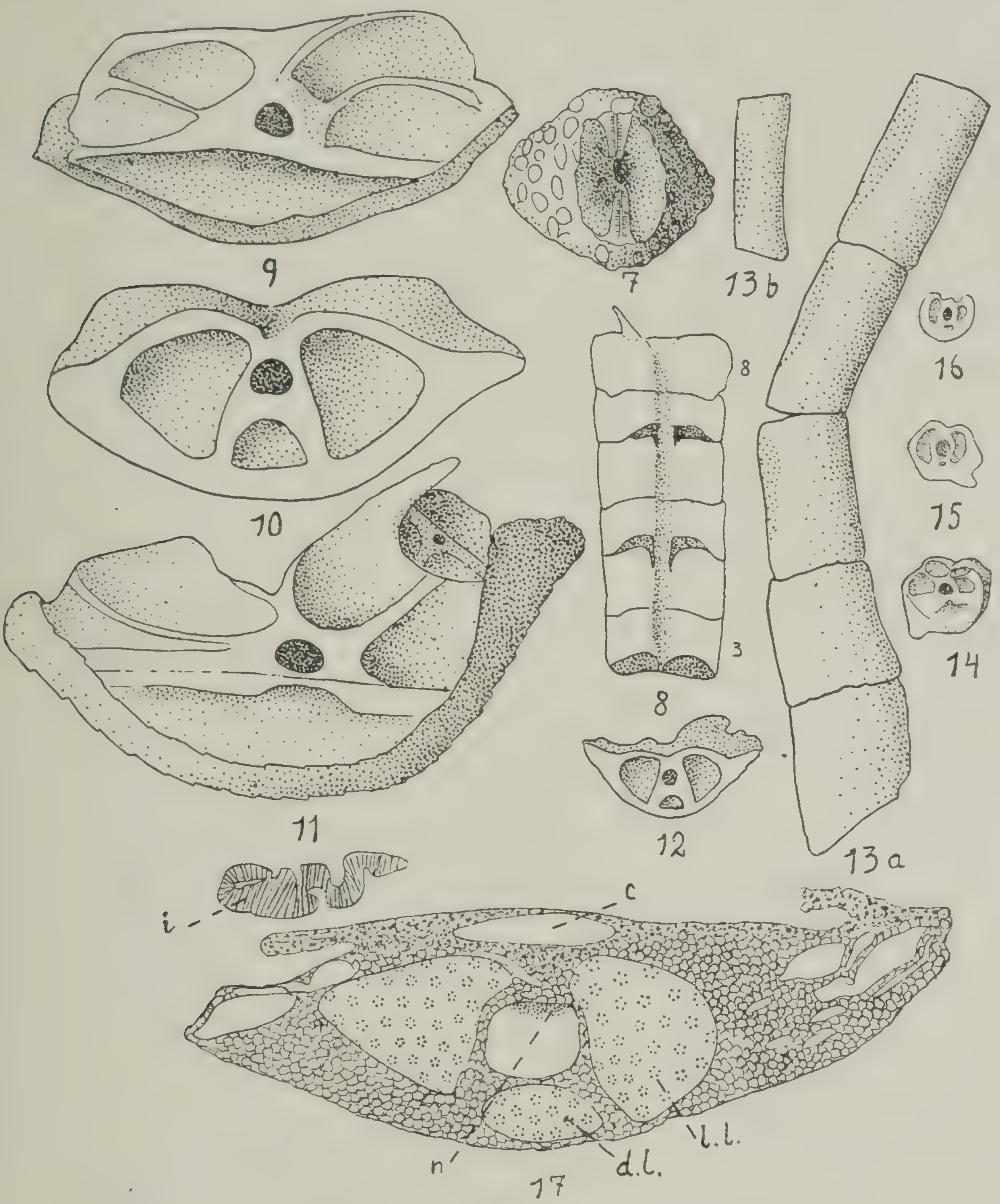
synarthry at about the 12th articulation. The angle that the synarthrial crest forms on the proximal and distal face of a joint is usually about 120°, but can sometimes, as in the penultimate segment of the stem preserved, be 0°, i. e. the crests in such cases



Figs. 1—6. *Porphyrocrinus verrucosus.* 1) Upper part of the stem and the crown. The median arm is removed all the way from Br 2 to show the extension of the disk. Anal cone to the right, a regenerated arm to the left. Two pouches of the perisome visible, adhering to the arm from about Br 10—12, $^{3}/_{1}$; 2) 10 uppermost stem-joints, calyx, and Brr 1—4 of the crown, $^{10}/_{1}$; 3) 11th—17th stem-joint, $^{10}/_{1}$; 4) 32th—35th stem-joint, $^{6}/_{1}$; 5) The two most distal stem-joints of the preserved stem, $^{6}/_{1}$; 6) Proximal end of the most distal columnal, $^{6}/_{1}$.

being parallel. In one case, between columnals 33 and 34, there is a synostosis also in the more distal part of the stem. The diameter of the stem immediately below the crown is 1.5 mm, 60 mm. from the calyx the stem measures 2.6 mm, at the penultimate segments the broadest diameter is 3.5 mm. (= the longitudinal direction of the synarthry), shortest diameter (= cross section of the synarthry) is 2.4 mm. L. of the 10 first segments 3 mm. L. of the penultimate columnal 5.5 mm. The stem, which in proximal

parts is quite smooth, gets at about the 40th joint irregular pits on the sides of the columnals. From the 57th segment and to the



Figs. 7—17. *Porphyrocrinus verrucosus.* 7) Distal end of the most distal stem-joint, $\times 5^1/_2$; 8) 3rd to 8th Brr, ventral view, $\times 6^1/_2$; 9) Proximal articular face of Br 3, $^{23}/_1$; 10) Distal syzygial face of Br 3, $^{23}/_1$; 11) Distal face of Br 8, a pinnule-facet to the right, $^{23}/_1$; 12) Distal face of Br 7, $^8/_1$; 13a) 5 proximal segments of a pinnule from Br 14, b) 9th segment of the same pinnule, $^{23}/_1$; 14) 1st pinnular from a pinnule on Br 12, distal articular facet, $^{17}/_1$; 15) 2nd pinnular of the same pinnule, distal facet, $^{17}/_1$; 16) 6th segment of the same pinnule, distal facet $^{17}/_1$; 17) A transverse section through the non-muscular articulation between Br 9 and 10. The blotchy tissue signifies the decalcified Br; l. l. = lateral ligament, d. l. = dorsal ligament, c = coelom, n = dorsal nerve (shrunk), i = a remnant of the intestinal wall, $^{40}/_1$.

end of the stem the stalk is covered by the curious calcareous granulation mentioned above. There are no traces of any radicular (rhizoid)

appendages. The most distal segment bears on its distal face a synarthry, the stem is therefore evidently not complete, but to judge from other signs (the knobby apparance of the distal stem-part) the broken, most distal stem-part cannot have comprised many segments.

BB pentagonal, h. and br. about equal, 0.9 mm, united to each other by close sutures.

RR h: 1.3 mm, distal diameter 1.9 mm, the distal border sligthly concave. With the BB forming a smooth cup in which the separate ossicles are connected by close, though very distinct, sutures.

Arms V, broken at the tips, preserved part of longest arm 41 mm. with 63 Brr. (Calyx + arms 44 mm. here). Lateral borders of the proximal Brr in close apposition as far as Br 8 and provided with sharp lateral edges. Nothing of the disk visible to external view when the arms are in situ and folded up over it. Br segments smooth, with a very weak longitudinal rifling of the dorsal surface, discernible only at high magnification. Besides there occurs an indistinct and weak granulation of the dorso-lateral borders of the proximal Br ossicles from Br 3 to about Br 8. Non-muscular articular facets with a dorsal ligament pit and two large lateral fossæ just as in a young syzygy when the first 2 septa are formed (cf. Echinoderm studies, p. 76). These connections regularly alternate with the muscular articulations; few exceptions in the outer parts of the arms. All Br segments shorter than broad. Thickest part of the crown about Br 10, the diameter here being 4.8 mm. Example of distribution of syzygies and of occurence of pinnules in the proximal arm-part:

Br $1+2\ \ 3+4\ \ 5+6\ \ 7+\underline{8}\ \ 9+\overline{10}\ \ 11+\underline{12}$ . . .

In distal arm-parts e. g.:

. . . $21+\overline{22}\ \ \underline{23}\ \ 24+\overline{25}\ \ 26+\underline{27}\ \ \overline{28}\ \ 29+\underline{30}\ \ 31+\overline{32}\ \ 33+\underline{34}\ \ 35+\overline{36}\ \ \underline{37}\ \ 38+\underline{39}$ . . .

The first pinnule occurs in 4 cases out of 5 to the right on Br 8, in one case to the left on Br 10. Thus the first suppressed pinnule must in all five cases have occurred to the left on Br 2. The most proximal pinnules slightly angular proximally. First two segments about squarish, following longer than broad, L=2—3×br, distal segments rather distinctly swollen at the articulations. Two proximal pinnules (on Br 12 and 14) with about 13 segments, 7 mm. The articulations between the Br and the first pinnular and between the first 2 pinnulars is a normal muscular articulation as usual.

Between the more distal pinnulars we get the type of the pinnular articulation, but without muscles, i. e. the same articulation as described above in the non-muscular articulations of the arm. The dorsal ligament is only inconsiderably represented by a small pit. No side or covering plates.

As evidenced by sections through a proximal pinnule (fig. 18) the specimen is a female. There is an opening of the genital gland on the side of the pinnule near the distal end of the gonad. I have not observed any sacculi.

The arms and the disk do not seem to contain fertile gonads, as far as I can judge from sections through pieces of the arms and the body-wall, the last mentioned pieces picked out from the vicinity of the bulbous swellings described below.

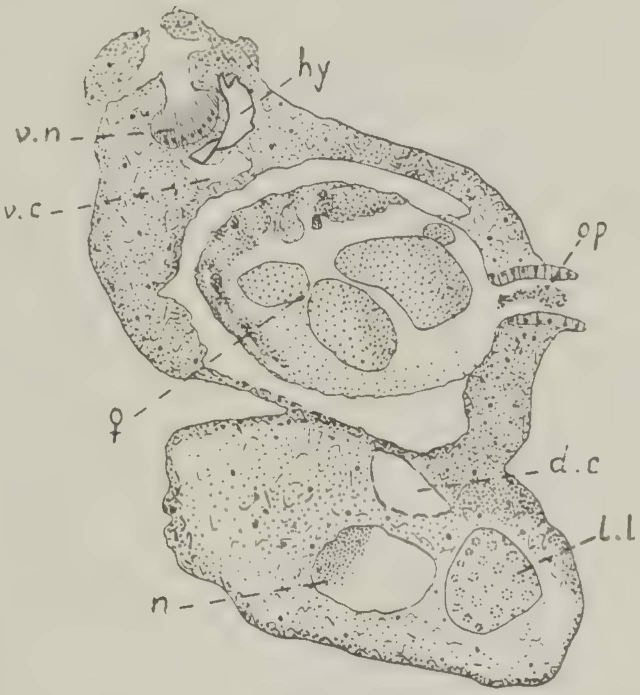


Fig. 18.
Porphyrocrinus verrucosus. Transverse section through a pinnule from Br 10. d.c=dorsal coelom, v. c=ventral coelom, hy=hydrocoel, v. n.=ventral nerve, ♀ = female genital gland (slightly shrunk), op=its opening. Otherwise indications as in fig. 17, $^{150}/_{1}$.

Disk stretching to Br 10. The ventral face of the perisome provided with 5 bulbous thickenings, one to each arm; these swellings continue to Br 12. They seem to contain processes from the intestine only (cf. fig. 17). Anal cone long and narrow stretching to Br 16, with some few calcareous granules, otherwise as the disk naked. There are no orals visible.

Occurence: The Kei Islands, Station 56. 5^0 30' S. 132^0 51' E. 345 Meters. Mud. $^{10}/_{5}$ 1922. Coll. Th. Mortensen. One specimen, the type, in the Zoological Museum of Copenhagen.

When considering the affinities of this new type one can first of all exclude the Hyocrinids, as the members of this family have short and discoidal joints throughout the whole stem, the columnals being connected with one another by means of synostotical articulation. By the long joints, in the distal part of the stem connected by synarthry, the new type evidently approaches *Bathycrinidæ* and

Phrynocrinidæ. Among the genera belonging to these families we may immediately leave out of consideration the genera *Democrinus* and *Bythocriuus* as they are highly specialized types with strongly prolonged BB forming the chief part of the calyx. Neither *Bathycrinus* nor *Ilycrinus* can be considered as being more closely relatod, as these genera have X arms and, besides this, a different distribution of the syzygies in proximal arm-parts. Moreover, the BB in these two genera are coalesced into a solid basal ring; in *Porphyrocrinus* they are separated by distinct sutures. Also *Monachocrinus* differs from *Porphyrocrinus* by having arms branching after the 2nd post-radial ossicle. *Rhizocrinus,* though with simple arms, differs by having the BB coalesced into a solid ring and by the radial ring being attached to the BB through a very close anchylosis, sometimes so close as to efface the sutures between the RR and the basal ring. Besides in *Rhizocrinus* the 2nd stem-joint already is squarish, in *Porphyrocrinus* the 15th first attaining this length. In *Rhizocrinus*, as in all genera of *Bathycrinidæ* mentioned above, the disk is tolerably moderate, not stretching higher than to Br 3. In *Porphyrocrinus* it is, on the contrary, high and large, reaching to Br 10 or 12. In this feature the new genus approaches *Phrynocrinus* which, as emphazised in my work Echinoderm Studies (1924, p. 213), has a very huge disk. In the *Bathycrinidæ* the Brr after Br 2 all seem to have high vertical flanges forming the attaching facets for the muscular bundles; in *Porphyrocrinus* the Brr are very flat and low, never with large ventral processes (cf. also *Phrynocrinus.* Matsumoto, Annotat. Zool. Japon. Vol. 8 p. 222 fig. f, 1913).

The pinnulars in *Porphyrocrinus* are also low and never provided with the high flanges, protecting the genital glands, which occur e. g. in *Ilycrinus* (cf. Echinoderm studies, fig. 125).

From these reasons it seems most natural to range the new type in the *Phrynocrinidæ.* There are besides, as in the members of *Phrynocrinidæ* known before, no radicular appendages on the distal stem-joints. I will admit, however, though it does not seem probable, that they may perhaps occur on the most distal part of the stem, lost when the animal was captured. *Phrynocrinus* is sharply distinguished from the new genus by the short stem-joints, by the low basal ring (triangular BB in *P. nudus*, pentagonal and slightly higher, L = $^1/_2$ br., in *P. abortus*), by the wide interradial interspaces

which are filled up with the large disk bulging out betwen the arm-bases, by the syzygies which occur only sparsely, and by the arms branching two or three times after about I Br 20. *Porphyrocrinus*, on the contrary, has long stem-joints, stout basal ring, close arm-bases, syzygies between each other joint usually, and V arms. Thus we have only *Naumachocrinus* remaining. From this genus also the new type must, however, be considered to differ generically. The basal ring in *Naumachocrinus*, just as in *Phrynocrinus*, is very short, the BB barely in contact laterally, the L. is less than the br; in *Porphyrocrinus* they are as high as broad. In *Naumachocrinus* the RR are enormously prolonged; in *Porphyrocrinus*, though slightly longer than broad and longer than the BB, only inconsiderably so. In *Naumachocrinus* the 3 first stem-joints are short and discoidal then rapidly attaining the length of the full-grown joints (L = br at the 6th columnal); in *Porphyrocrinus* there are 9 short discoidal proximal stem-joints and the first squarish columnal is about the 15th stem-joint. The different appearance of the distal stem-joints is also very distinct; in *Naumachocrinus* very coarse, greatly swollen at the articulations, no granulation of the surface; in *Porphyrocrinus* slender, inconsiderably expanded at the ends, and studded with the very singular calcareous granulation which has no correspondence among other recent Crinoids and is very rare also in post-permian ones. The colour in *Phrynocrinus* was a dull greenish yellow or yellowish brown, in *Naumachocrinus* (specimen in spirit) dull white in the single specimen known (no record of its colour in life; A. H. Clark in a letter to me); in *Porphyrocrinus* it is a deep purple altering very slightly in spirit. By this colour it differs also from all the *Bathycrinidæ* which are whitish, greyish, or yellow.

The diagnosis of the new genus must then be the following:

Porphyrocrinus n. gen.

A Phrynocrinid genus in which the stem is long and slender with numerous short discoidal joints proximally, long joints distally (L = about $2 \times$ br). Doubtful if the granulation of the distal stem-joints can be regarded as a characteristic of generical value. BB about as high as broad. RR slightly higher. Arms V with low and flat articular Br facets. Arm-bases in close apposition. Syzygial articulations with 3 fossæ. (Perhaps in all *Phrynocrinidæ*, cf., how-

ever, Matsumoto 1913, fig. f). Brr short. Proximal pinnules lacking. 1st suppressed pinnule to the left (1st developed pinnule to the right on Br 8 usually). Pinnulars without flanges, tolerably low. Disk stretching high up between the arms, naked, with a long and narrow anal cone. No side- or covering plates.

The diagnosis of the *Phrynocrinidæ* with our present knowledge of the family must be the following: Stalked *Articulata*, without cirri, in which the stem-joints are connected by synarthry, excepting some relatively few proximal columnals connected by synostosis. No radicular appendages. Distal part of the stem terminating with a calcareous plate fixing the animal to the substratum. No proximal developed, on the contrary a perpetual formation of new columnals under the calyx. IBB unknown, if present in a very rudimentary condition. BB rather short, never prolonged, always distinctly separated from each other by sutures. RR moderate to very prolonged. Proximal pinnule-gap. Disk high and large, perisome naked.

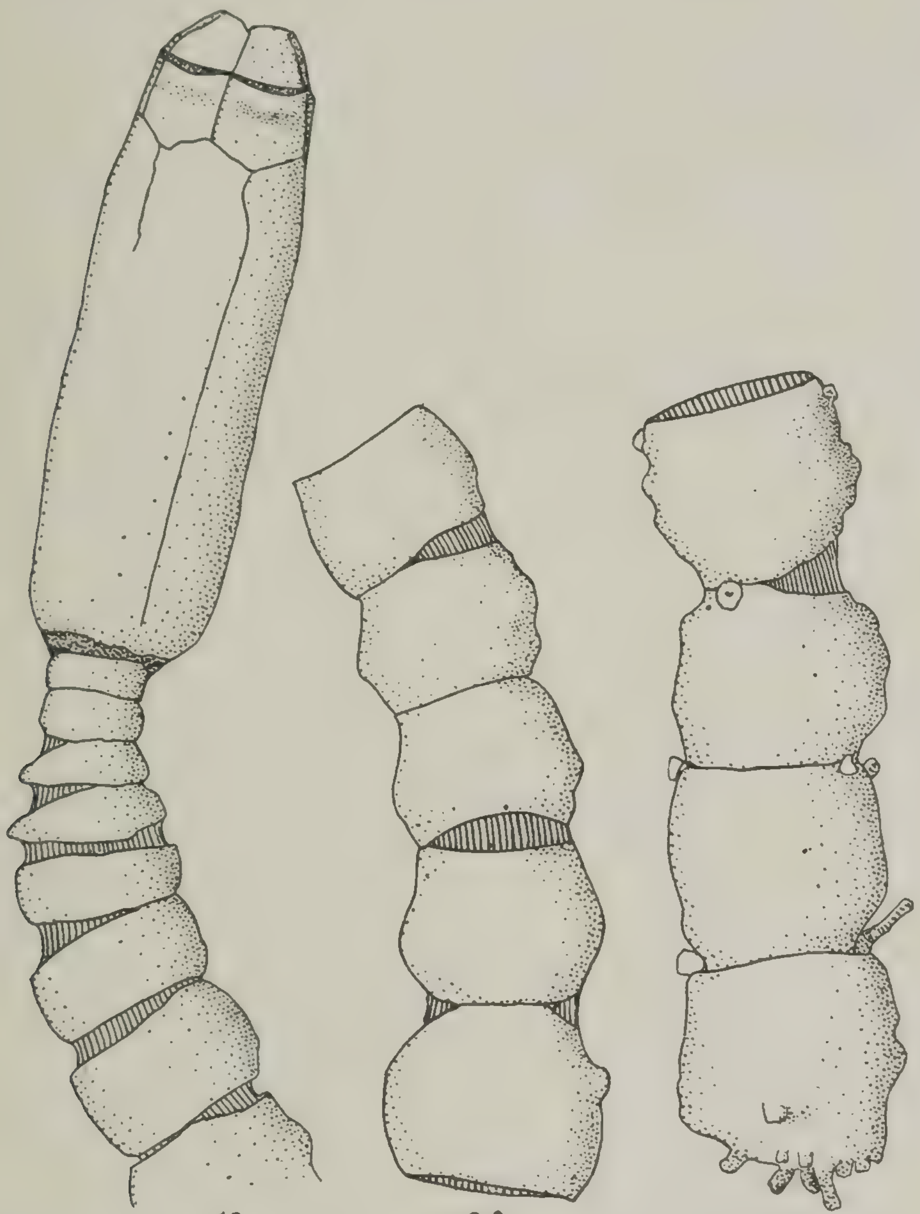
Democrinus globularis n. sp.

Figs. 19—21; 22, 3.

Stem with 17 segments, total length 26 mm. The 5 or 6 first segments short and discoidal, rapidly increasing in diameter. The first segment almost hidden under the dorsal part of the calyx. From the 10th segment globular columnals, about as long as broad or slightly longer distally, provided with an indistinct girdle of very weak tubercles on the middle of each joint. Articular facets for radicular appendages from the 14th segment, usually coupled two and two on opposite sides of the proximal part of the joint. The most distal joint with numerous small rhizoids at the distal end. The stem has therefore, possibly, terminated with this joint, which has been provided with a bunch of radicular appendages. Diameter of the stem closely under the crown 1.2 mm; 5 mm. distally of the calyx 2 mm, and 2.6 mm. distally. L. of the most distal joint 2.6 mm.

L. of the calyx (BB + RR) 7.3 mm. L. of BB ± 6 mm. Breadth of the calyx 2.3 mm (in the proximal part), 2.6 mm. closely under the RR, 2.0 mm = br. of radial ring ventrally. BB very long and closely anchylosed, the sutures most often effaced, only discernible in exceptional cases. RR about as high as broad with a shallow

ring-groove near the ventral border. Brr 1 smooth truncatedly conical, h. 0.7, br. 1.1 mm. Arms broken at the connection between Br 1 and 2. Colour in spirit white. According to Dr. Mortensen the same in the living specimen.



Figs. 19—21. *Democrinus globularis.* 19) Calyx and the 8 most proximal stem-joints, 20) 9th—13th stem-joint, 21) 14th—17th stem-joint, all $^6/_1$.

Occurrence: The Kei Islands, Station 56. 5° 30' S. 132° 51' E. 345 Meters. Mud. $^{10}/_5$ 1922. Coll. Th. Mortensen. One specimen, the type, in the Zoological Museum of Copenhagen.

This is the specimen named *Democrinus weberi* on p. 95 of Dr. Mortensen's Report on the Danish Expedition to the Kei Islands (Vid. Medd. D. Naturh. Foren. Bd. 76).

This species cannot be confounded with any *Democrinus* hitherto described. The wide, though cylindrical calyx abruptly surpassing the br. of the proximal part of the stem gives the animal a very

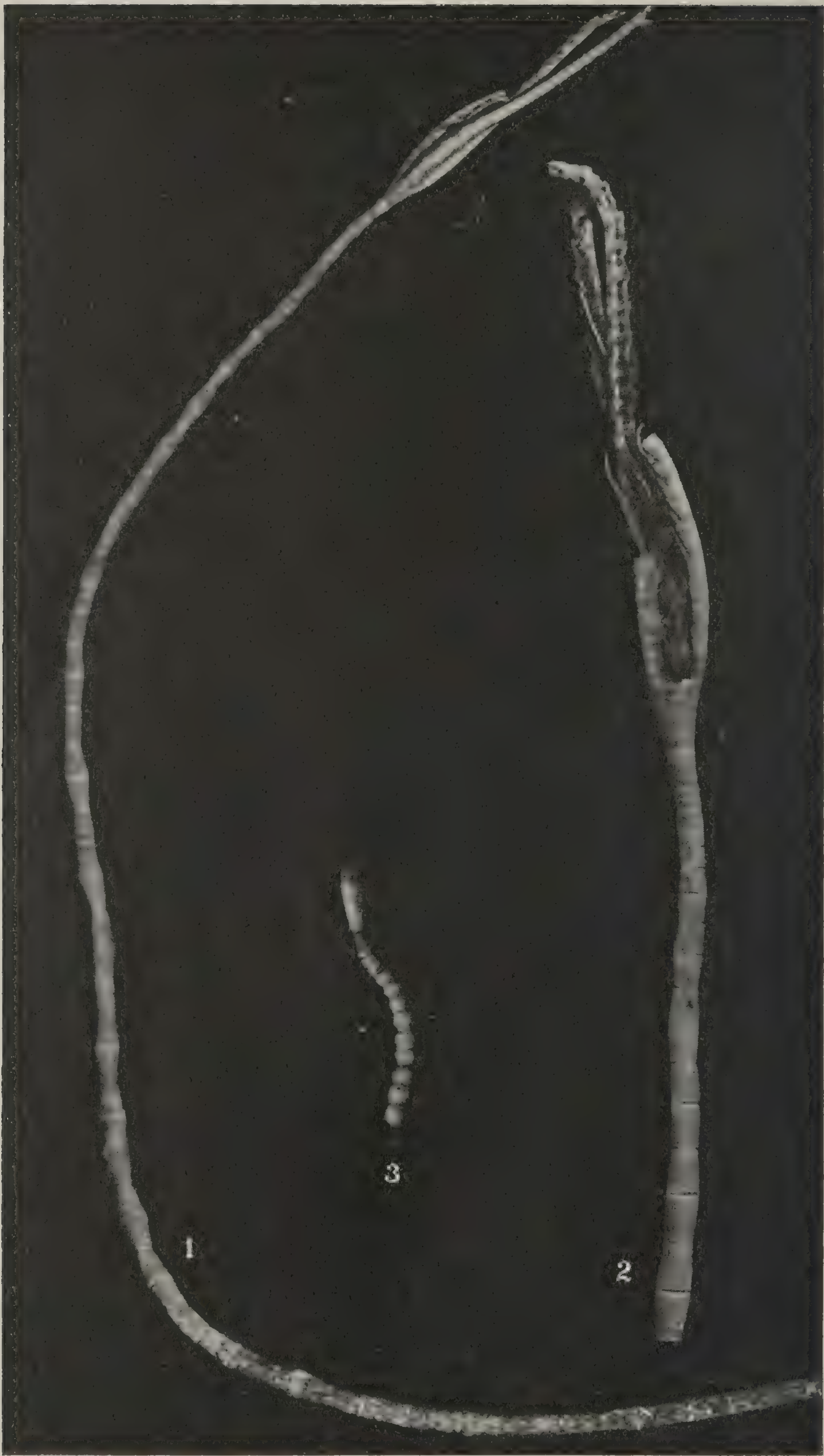


Fig. 22. 1) *Porphyrocrinus verrucosus* n. g. n. sp., nat. size: 2) Calyx and upper part of stalk 2/1. — 3) *Democrinus globularis* n. sp., nat. size.

curious appearance reminding one of a tape-worm, e. g. *Dibothriocephalus.* We have an appearance distantly reminding of this type in a somewhat abnormal specimen figured among the *Bythocrini* of Dr. Mortensen's Japanese Crinoids, to appear later on (fig. 53). The globular distal stem-joints are also very characteristic and unparalleled among other recent stalked Crinoids. Perhaps the stem terminated with the 17th segment, which on its distal face has a cluster of radicular appendages, but this may possibly be a secondary phenomenon — the stem broken and the radiculi budding out on the distal face of the last columnal.

30.V.25.

Papers from Dr. Th. Mortensen's Pacific Expedition 1914—16.

XXVII.

Planarians. Part IV.

New Stylochids.

By

Dr. **Sixten Bock**, Uppsala.

(With Plates III and IV).

Introduction.

The present paper deals with all the Stylochids collected by Dr. Th. Mortensen in the Pacific and in the Malayan Archipelago except the new genus *Discostylochus* already treated in a separate report. It is of special interest that the material has afforded an opportunity to increase the knowledge of the remarkable genus *Enterogonia* Haswell. The systematic position of this genus has been wrongly interpreted on account of the circumstance that certain for the classification highly important features have hitherto remained unobserved. It was supposed to lack tentacular groups of eyes, tentacles, and prostatic vesicle. As these features are not outstanding and must be especially searched for to be detected, it was rather permissible for the describer of it to fail to recognize them.

Three new genera are represented in this collection. 1) *Ilyplana* from New Zealand is provided with a rich amount of cyanophile glands emptying their secretion in the antrum masculinum, a peculiar feature in the family. Its female apparatus shows close agreement, as does also the location of the genital pores, with that of the genus *Stylochus*. But there is, however, an indistinct trace of a ductus vaginalis. 2) *Kaburakia* from Vancouver has a ductus vaginalis of the same type as that of the genera *Cryptophallus* and *Bergendalia*, but is easily separated from these through the occurrence of well-developed stout tentacles and through the organization

of the male apparatus. 3) *Leptostylochus* from New Zealand has a large Lang's glandular vesicle and rudimentary tentacles.

There are further two new species, both obtained at Amboina, the one belonging to the genus *Cryptophallus*, previously known only from South Africa, the other a member of the genus *Stylochus*, widely spread in the warm seas and containing numerous species. A survey of the general arrangement of the eyes in the family is included in this paper for the purpose of calling the attention of future investigators to this character.

I have found it necessary to add a key of determination according to our present knowledge of the family. In 1913 there were seven genera included in the family. Since that time the number has been augmented to the double.

The paper ends with a list of the geographical distribution of the Stylochids, revised up to date.

Stylochus marmoreus n. sp.

(Plate III, Figs. 1—6; Plate IV, Fig. 30.)

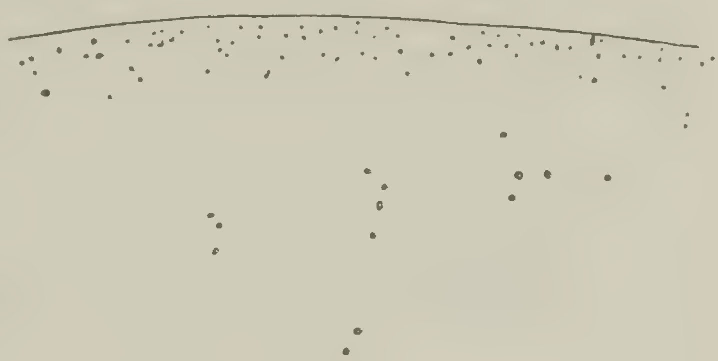
Locality: Amboina.

Material: Two specimens collected February 10, 1922, and preserved in formalin.

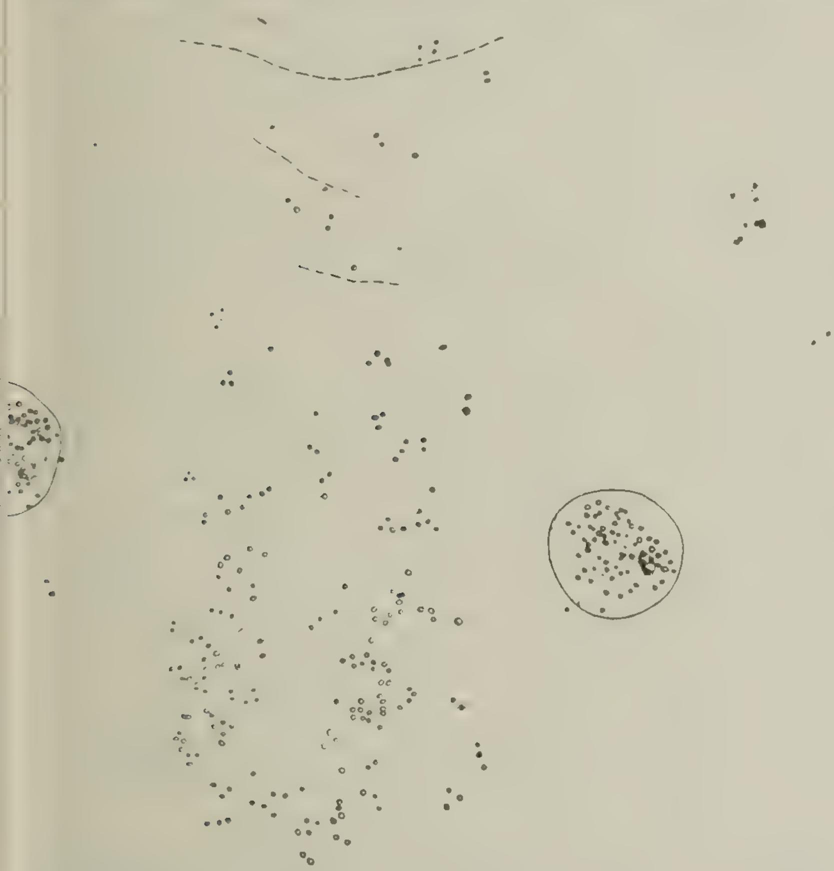
Habitus: The appearance of this new form is quite typical for the genus *Stylochus* (Plate III, Figs. 1 and 2). The body is rounded, very thick in the central parts, and thins out towards the margins. The consistency is, as is usual in Stylochids, very firm and compact. The tentacles are low and represent half-globe-shaped prominences. The upper surface of the animals shows a greyish brown colour with a violet tint. The pigmented patches anastomose freely; the unpigmented interspaces, being more or less inconsiderable in extent, give the body a marmoreal texture. The assemblage of pigment shows a tendency to become gathered in the central area, which is a common feature in brown-pigmented Polyclads. At the margin of the body the pigment patches are less gathered (Plate III, Fig. 3). The tentacles are pigment-free but for the cup-pigmentation of the eyes. The large number of ocelli, which to a great extent fill the tentacles, gives them a pronounced black appearance (Plate III, Fig. 4). The area above the brain, or rather where the cerebral eyes are gathered into clusters, is nearly pigment-free, and the

colourless patches extend as far as the cerebral clusters reach, showing that the absence of pigmentation clearly depends on the distribution of ocelli.

Measurements: The first given here have been made on the larger specimen. Total length of animal 28 mm, greatest breadth 21 mm. Distance of tentacles from anterior margin of body 6 mm, between the two tentacles 2 mm. Male aperture 1.7 mm from caudal margin, and female gonopore close to the male opening. Mouth nearly subcentral. The smaller specimen measures 22 mm, with a maximum breadth of 20 mm, and has the mouth 12 mm and the male aperture 2 mm from the hinder margin of the body; the pharynx is 9 mm long and the post-pharyngeal region reaches $6^3/_4$ mm in length. The interdistance of sexual pores is 0.2 mm.



Text-fig. 1. *Stylochus marmoreus* n. sp. Marginal eyes at the frontal end of the body. 24 x.



Text-fig. 2. *Stylochus marmoreus*. Cerebral, tentacular, and some of the frontal eyes of the smaller specimen. The interrupted lines indicate folds of the body. 16 x.

Arrangement of eyes: The marginal ocelli are densely arranged in rows, but only in the anterior part of the body (text-fig. 1). The marginal ocelli diminish in numbers very considerably already in the body-zone lying between the tentacles and the mouth. The hinder part of the body nearly entirely lacks eyes; only few observed. There is quite a difference between the size of the marginal ocelli and that of the others; the former being far less conspicuous (cf. text-figures). The cerebral eyes are arranged in two, but not

fully separated, clusters (text-fig. 2). They blend especially in their posterior parts. The number of cerebral ocelli, about 150, is rather moderate for the size of the body. Most of them occur in dense clusters behind the line connecting the two tentacles. The frontal eyes are sparse, being made up of some indistinct groups of a few eyes. Such eyes also occur laterally and fronto-laterally toward the tentacles. The tentacular groups comprise a considerable number of eyes and most of them are embedded in the interior of the tentacles. As a result, the latter appear as two black-tipped prominences (Plate III, Fig. 6).

The anatomy of this species, well characterized through its exterior appearance, deserves no extensive study, as it agrees fairly well with the type of the genus. A few features may, however, be mentioned.

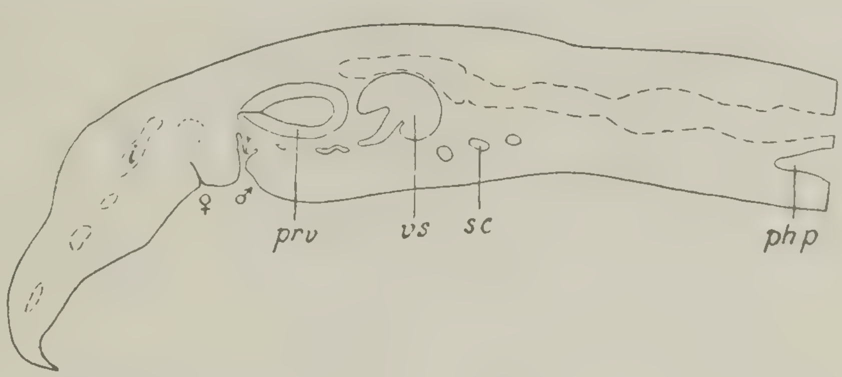
The epidermis hardly contains any typical rhabdites. Instead of them and, as far as I can see, substituting them, there is a large-granular acidophil secretion. The granulæ are of fairly even size, intensively stainable with eosin, and hold about 2 μ in diameter, thus surpassing the granules of shell glands about two or three times. The gland cells in question abound especially in the dorsal epidermis, and occur in such large numbers that, when examined at a low magnification and by use of hematoxylin-eosin preparations, they give it a uniform red colour.

On the ventral side of the animal, the muscle wall of the body is about three times the thickness of the ventral epidermis. On the dorsal side it is, of course, much thinner, as it lacks the inner longitudinal layer; thus the high dorsal epidermis nearly equals the dorsal muscle wall in stoutness. The dorso-ventral musculature appears unusually well-developed, in remarkable contrast to the muscle wall of the body, the fibres occurring in excessive numbers and showing great coarseness. The parenchyma seems rather consistent.

The extremely folded pharynx is on the larger specimen partly protruded through the mouth and forms a dense rosette visible on the specimen made transparent in oil and reproduced on Plate III, Fig. 5. The pharyngeal pocket, holding about half the length of the animal, does not extend very far back (text-fig. 3), there being a well-marked distance to the male apparatus. Its side-pockets are

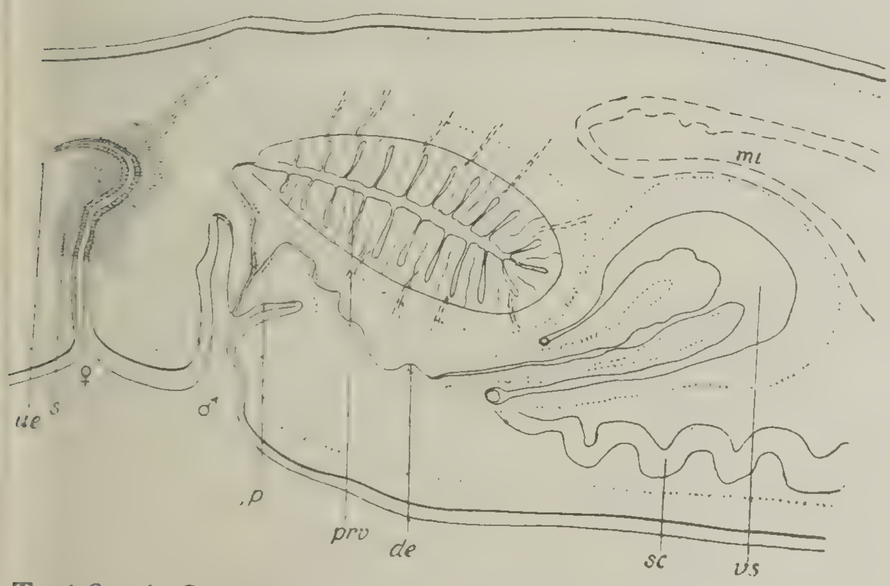
deep. The main gut has a large calibre and the non-anastomosing. bead-like, thick-walled side-branches are stout and densely arranged. They do not possess ventral pouches as in *Leptostylochus*.

As in most *Stylochus*-species, the testes are ventral, the ovaries dorsal. Both approach the muscle wall of the body. The testes are much more sparsely distributed than the ovaries.



Text-fig. 3. *Stylochus marmoreus.* Sagittal section through the hinder end of the body to demonstrate the location of the male organ and sexual pores in relation to the pharyngeal pocket (php). 12 x.

As can be observed on Plate III, Fig. 5, several canals occur on each side of the pharynx. Taking a caudal course, these sooner or later join each other. As they are abundantly filled with eggs, they are very distinct in the mounted specimen. Being ventral to the intestinal coeca, their location makes it evident that this branched system of canals corresponds to the normal unbranched uteri of other Stylochids. The feature in question is not, however, new for the family, as I have previously mentioned the same condition in another species of *Stylochus*, *orientalis* Bock and its variety *splendida* (Bock 1913, Figs. 2a and 3, Taf. V) and I have, furthermore, observed it in some other *Stylochus*-species from my Pacific journeys. In the description of these forms I shall treat this question more extensively.



Text-fig. 4. *Stylochus marmoreus.* Schema of the genital apparatus. 45 x. de, ductus ejaculatorius; mi, main intestine; p, penis; prv, prostatic vesicle with its radial chambers (the dotted line marks the circumference of the muscular envelope and the interrupted lines indicate the ductules of the extracapsular gland cells); s, shell gland exits; sc, left seminal canal; ue, entrance of the uteri into the vagina; vs, tri-lobed vesicula seminalis.

The vagina (text-fig. 4) is quite typical, with well-developed shell gland duct and a short pars externa vaginae. It lies at the

beginning of the second third of the post-pharyngeal body-section (text-fig. 3).

The male organ (text-fig. 4) shows a large oval vesicula granulorum with thick muscularis traversed by very numerous and broad gatherings of exits for the extra-capsular prostatic glands. (Plate IV, Fig. 30). The inner lining of the vesicula is richly folded, thus forming a large number of radial chambers arranged very regularly. In a sagittal section of the prostatic vesicle, 15 to 20 such chambers can be observed at the same time (Plate II, Fig. 30, prc). In a strict sense the epithelium does not as usual contain gland cell bodies, as these are embedded in a thick layer between it and the muscularis. On account of the stoutness of the layer of intracapsular gland cells, the lumen of the vesicula is reduced to a canal-system. The extremely musculated vesicula seminalis belongs to the Djiboutiensis-type, and is thus three-lobed, lying partly under, but to its greater part anterior to the prostatic vesicle (text-fig. 4). The medial prong of the seminal vesicle is not so stout as the lateral prongs, and soon assumes the character of a sinuous ductus ejaculatorius (de). Halfway in the fleshy conical penis this unites with the efferent duct of the vesicula granulorum, thus establishing a feature similar to the penis of *S. orientalis.* The antrum has a development similar to that of *S. orientalis.*

In its inner anatomy the new species agrees best with *S. orientalis* Bock. In exterior appearance, distribution of eyes, its more feebly developed muscle wall of body, the larger interspace between pharynx and male apparatus, etc., the species shows pronounced differences from *orientalis* and its variety *splendida.*

Ilyplana aberrans n. g. n. sp.

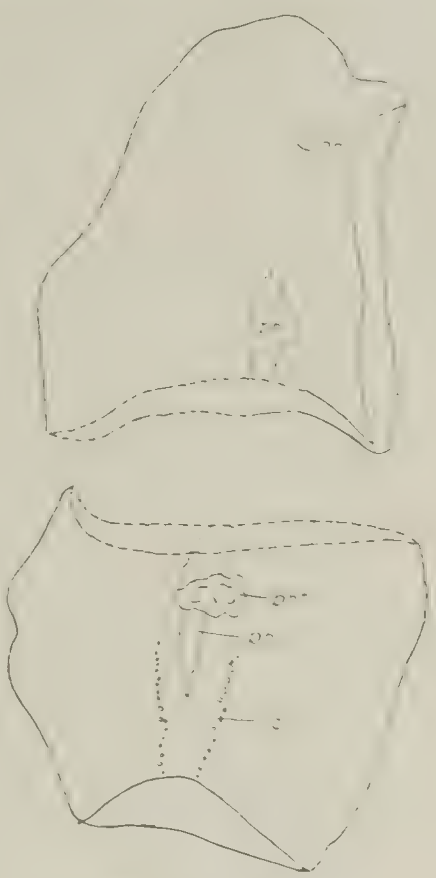
(Plate IV, Fig. 22).

Locality: New Zealand, Colville Channel. 35 fathoms. Sand and mud.

Material: One specimen collected July 21, 1914.

Habitus: The shape of the animal is more nearly elongated oval, with the lateral lines converging slightly more in the caudal than in the anterior part. The body is thin, 0.8 mm, and delicate and shows on the whole more similarity to the *Leptoplanid*-habitus than to the usual *Stylochid*-appearance. On account of the great curving

of the body, a photograph is not reproduced. Instead I give a camera drawing of the animal cut in halves (text-fig 5). There are only the slightest traces of two tentacles, in the shape of hardly visible protuberances of a circumference much smaller than the group of tentacular eyes.



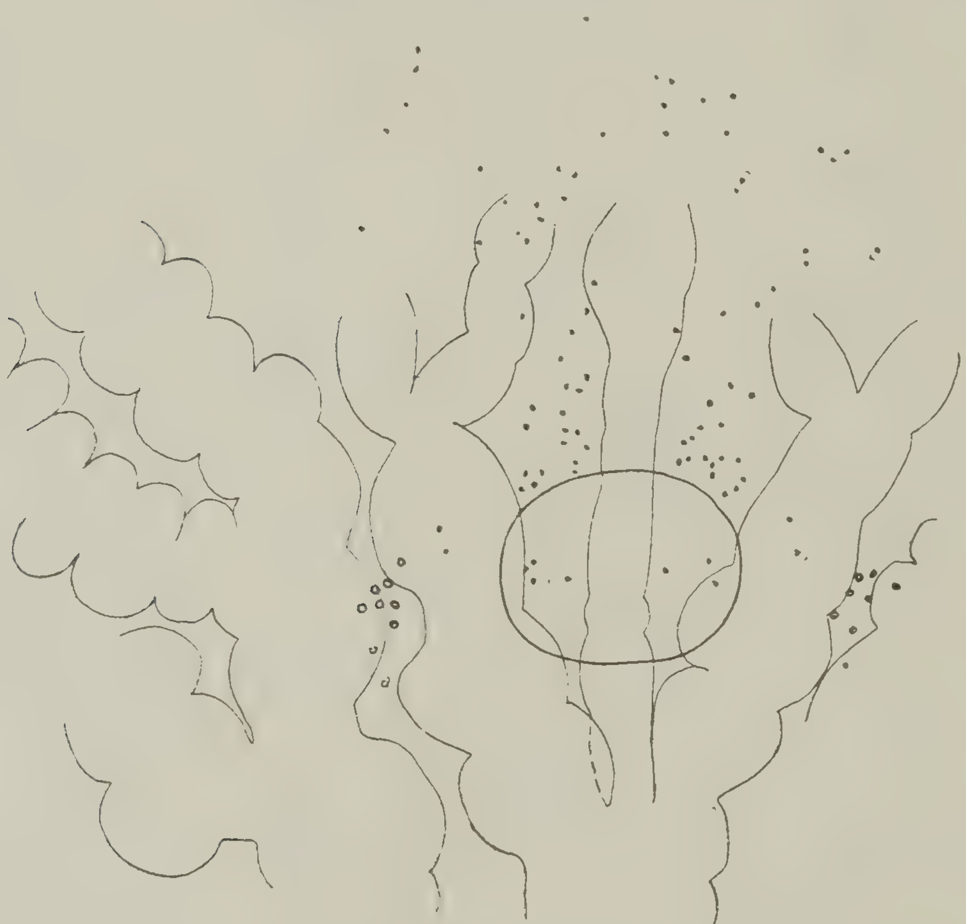
Text-fig 5. *Ilyplana aberrans* n. g. n. sp. Outline of the animal cut in halves. As the figures are drawn with the help of Abbes camera and the body halves are slightly bent ventralwards in the sagittal line and dorsalwards in the transverse line, a certain allowance for these circumstances must be made. The anterior part in dorsal, the posterior part in ventral aspect. About 5 x. br, brain; ph, pharynx; php, pharyngeal folds outside the mouth; sc, large seminal canal.

The colour of the alcoholic specimen is on the upper surface a uniform dark greyish green. No trace of a pattern is visible, nor does the series of sections show any accumulations of pigment granules in the body tissues. The colour seems to belong to the epidermis.

Measurements: The animal measures roughly 15 mm in length, and the greatest breadth (just where the mouth lies) is 6 mm. The brain, of a broad, rounded shape, lies about 2 mm behind the frontal margin, thus being somewhat nearer this than the pharyngeal pocket. The mouth is subcentral. The pharynx is about 5 mm long; that is, a third of the body-length, and its distance to the anterior margin slightly surpasses that to the posterior body-end. The sexual openings lie close to one another, their interdistance being only about 0.16 mm. The female pore is situated 0.8 mm from the caudal end of the body; that is, about $^1/_{19}$ of the body length. In the location of the sexual openings we thus meet with a close resemblance to the general conditions in the genus *Stylochus*. Arrangement of eyes: There are marginal eyes all around the body. Their distribution in one or two rows at the anterior body-end is shown in text-figure 6. In the posterior two-thirds, the ocelli are far more scattered (text-fig. 8). For a member of the family *Stylochidae* the cerebral eyes (text-fig. 6) show a rather small number. They are arranged in two clusters. The tentacular eyes, less than 10 in each group, are more scattered than could be expected from the extension of the insignificant tentacular protuberance.

The epidermis is rather low, about 20 μ, and not very rich in glands. The basement membrane is very consistent, looks homogeneous, and shows a friendly reaction to eosin. The poor development of the muscle wall and the large mass of parenchyma are the most noticeable features of the sections. The latter condition

Text-fig. 6. *Ilyplana aberrans.* Marginal eyes at the frontal end of the body. 45 x.



Text-fig. 7. *Ilyplana aberrans.* Cerebral and tentacular eyes. The brain and adjacent intestinal coeca also outlined. 40 x.

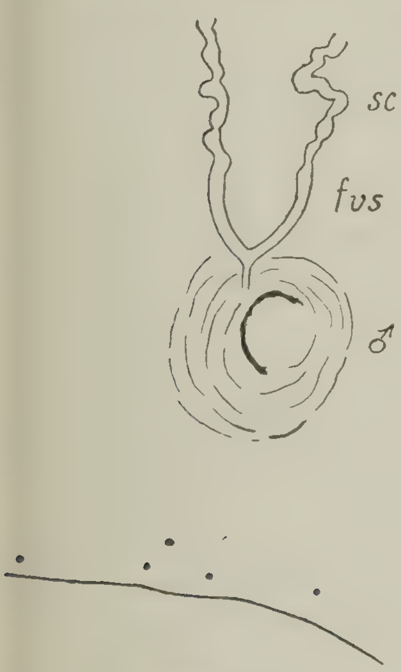
reminds one of the conditions met with in some *Planocera*-species (e. g. *Pl. pellucida).* Nor are there a great many embedded gland cells emptying their secretion to the epidermis. But besides the usual kinds of such gland cells, there are in the peripheral part of the body a great number of eosinophilous gland cells, which occur in the parenchyma and convey the secretion to the margin.

The dorsal muscularis does not reach a thickness of 20 μ, the ventral one not 30 μ. I have not previously met with such a feeble

muscle wall in the family *Stylochidae*, the members of which are characterized by their unusual firmness of body. This is actually to a great extent caused by the strength of the subdermal muscle walls and the large amount of dorso-ventral muscle bundles. The latter kind of fibres is in the new species very delicate and fine and is never present in excessive numbers.

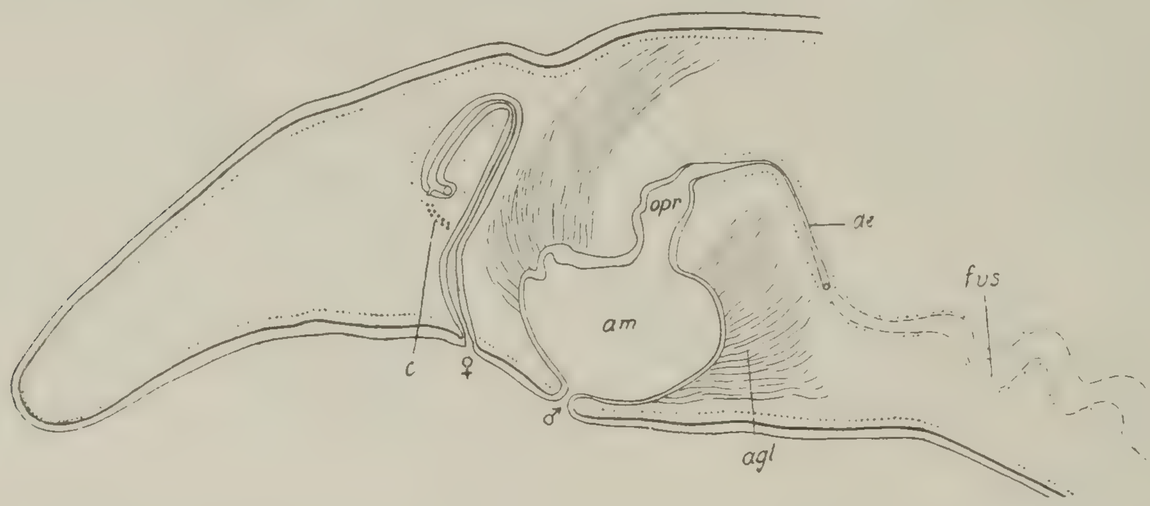
The pharynx is only moderately folded. The pharyngeal chamber is not large, and the side-pockets are small and insignificant (text-fig. 5). The latter feature is very unusual in Stylochids. The intestine shows ordinary conditions. The coeca are thick, beadlike, and do not anastomose. They are rather sparsely arranged, which makes it easy to trace their course and branching in toto preparations (text-fig. 7).

The testes and ovaries have the usual location. The latter are very scattered and in the present specimen as yet immature. The testes, on the other hand, are fully ripe and extremely abundant, and are arranged in a dense, often compact layer. The seminal canals (sc) originate on the sides of the pharynx and, slightly converging, continue in a sinuous course backwards. In their most caudal part, their course is changed, becoming more straight (Fig. 8), and at the same time they are provided with a somewhat stronger muscularis. But this does not at all reach such a strength that one is entitled to speak of a clear development of false seminal vesicles; further, the lumen is not widened in any pronounced way. Considering these circumstances, one would expect to meet a true seminal vesicle; i. e. an unpaired, median vesicle, in the animal, but this is, however, not the case. After the fusion of the two seminal canals, the ductus ejaculatorius thus formed proceeds without thickening or dilation in a straight course backwards and opens together with the vesicula granulorum into the antrum. The antrum masculinum, of fairly average dimensions, is to its greater part filled with a thick prominence of a half-globular shape (Plate IV, Fig. 22). This formation represents the penis, but is not traversed along its entire length



Text.fig. 8. *Ilyplana aberrans.* Posterior end of the body in ventral aspect. 24 x. fvs, the homologue to a false seminal vesicle; sc, large seminal canal.

by the ductus ejaculatorius as already indirectly indicated. This copulatory implement is, moreover, not symmetrically placed in the body, but displaced to the one side of the antrum. Compare in this respect the two longitudinal sections through the male organ,



Text-fig. 9. *Ilyplana aberrans.* Schematic longitudinal section of the genital apparatus. 45 x. agl, cyanophile glands running to the wall of the penis and antrum; am, antrum masculinum; c, double string of embryonic cells, supposed to represent a rudimentary ductus vaginalis; de, ductus ejaculatorius; fvs, «false seminal vesicle«; i. e. the end part of the large seminal canal; opr, opening of the prostatic vesicle.

represented in text-fig. 9 and Plate IV, Fig. 22. This displacement of the penis can hardly be a normal case, but as only one specimen is at hand, a verification of the view can only be made at some future date.

Having observed this feature in the series of sections, I had at first intended to desist from a description of the new species, particularly as it could not be ranked with any of the known *Stylochid*-genera. As time has passed, my hesitation has gradually disappeared, for in the future even less trained investigators can hardly meet any serious difficulties in comprehending the case and eventually making the necessary small corrections for the probable abnormity of this male organ. These corrections might then at the utmost apply to the orientation of the penis to the middle line of the body and the piercing of this organ by two, sooner or later united, canals, representing the efferent duct of the prostatic vesicle and the ductus ejaculatorius. Making due allowance herefore, the rediscoverer of the species will have no trouble with the indentification. Text-figure 9 shows the entrance of the male efferent duct into the antrum, such as the condition actually appears in the sections. Next to this entrance lies the penis-like implement, figured in longitudinal section on Plate IV, Fig. 22.

In the interior of the prominence, undoubtedly answering to a penis, the prostatic vesicle is located transversely to the body. On Plate IV, Fig. 22, it appears in trans-section. The muscular envelope of it is not very obvious, as the fibres are sparse and also loosely arranged. Thus it does not stand out from the surrounding tissue. The interior of the vesicle is lined with a glandular epithelium, which is not folded (Plate IV, Fig. 22, pre). Extra-capsular prostatic gland cells are also present. Although large, this prostatic vesicle does not on the whole have the appearance common for the genus *Stylochus*. A quite singular feature is the occurrence of an enormous amount of cyanophilous gland cells. These lie all around the prostatic vesicle, reaching far away on the sides and also to the dorsal muscle wall. Most of them empty their secretion, in the form of minute granules, on the surface of the penis, but many also in the antral wall in the neighbourhood of the prominence (Plate IV, Fig. 22 and text-fig. 9). The glands invest the tissues to such an extent that in hematoxylin-eosin stained sections this part of the body looks dark blue. A mass of this secretion is present in the antral lumen (Plate IV, Fig. 22). It is not impossible that the secretion may be called upon to form spermatophores, but in this respect no direct observation can, in any event, be related. However, if this be the case, there is no need for the penis-like prominence to be intromitted into the vagina. To judge from the size of it, this implement seems rather large for the vagina.

The uteri are unbranched. As full female maturity has not as yet been reached, they appear as straight-running, narrow tubes of considerable length.

In its main features the female apparatus agrees fairly well with that of the genera *Stylochus* and *Parastylochus*. The musculature is, however, rather weak, especially in its outer part (Plate IV, Fig. 22). Other details are readily understood from text-figure 9.

It remains to mention that a close inspection of the female apparatus has made it possible to detect a not very outstanding feature. Near the proximal end of the vagina, where it is bent in a forward direction, there occurs on the ventral side a depression in the epithelium. At this place, and joined to the depression, a double string of cells starts, which runs to the distal limb of the

vagina (text-fig. 9). The cells seem to represent young epithelial cells, but they are of a rather embryonic appearance, and no lumen is visible between the two rows. It is not improbable that this string represents a suppressed rudiment of a ductus vaginalis. A safe conclusion is, however, not possible from the conditions in the single specimen, as the appearance is a little too vague and there is no visible change in the wall of the vagina, where the string comes into contact with its ventral limb. It would be interesting to obtain more specimens of *Ilyplana* for a study of this mere rudiment of a ductus vaginalis. In spite of the very feeble development of this formation, I think that I am right in making the interpretation, but for full proof more specimens are desirable.

A discussion of the systematic position of the new genus cannot be omitted. It is at first obvious that the organization-features give relatively few holds for a settlement of its relationships. The shape of the body and the outer appearance of the animal present no striking features and do not allow a guess as regards the family to which the animal belongs, but only suggest that it is an Acotylean of rather indistinct type. According to my experience, such conditions are only met with in the Polyclads living in mud. When examining the specimen in alcohol, I could not, as the eyes were hidden, distinguish it with any certainty from the Leptoplanideans. The distance between the tentacular rudiments was, however, suspicious, as well as the location of the genital pores near the posterior end of the body. As a rule a Leptoplanidean has a narrow, prolonged tail-end and the genital apparata located more anteriorwards. But *Stylochoplana pusilla* Bock 1924 proves that the rule is not without exception. The arrangement of eyes conforms to the Stylochid-type and the location of the genital pores agrees perfectly with that of *Stylochus*. Seeing the specimen mounted in oil, I was able to detect the marginal eyes and accordingly at once suspected its being a member of *Stylochidae*. There are several Stylochids deviating from the characteristic Stylochid-appearance as it occurs in *Stylochus*, *Idioplanoides*, *Parastylochus*, *Kaburakia*, and *Cryptophallus*. Indifference in outer appearance show, for instance, *Neostylochus* and *Leptostylochus*. The arrangement of eyes conforms to the Stylochidean type, but simi-

larity to it occurs also in, for instance, *Plehniidae*, *Polyposthiidae*, and *Cryptocelidae*. The location of the genital pores conforms perfectly with that of the genus *Stylochus*. Furthermore, the female apparatus has a vagina of just the same type. Being here very moderately developed, the pharyngeal apparatus has, however, not the characterististics of the genera *Stylochus*, *Kaburakia*, *Parastylochus*, etc.; nor are the intestinal branches densely arranged. But these features cannot have a far-reaching importance. *Stylochus* has further well-developed tentacles; here there are merely traces of them, as is the case in, for instance, *Parastylochus*, *Cryptophallus*, *Neostylochus*, etc. The examination of the male apparatus settled definitively that the animal could not be ranked with the genus *Stylochus*, nor with any of the yet described Stylochid-genera.

The seminiferous system is of a simpler type than that of any other Stylochid, seminal vesicles being not distinctly developed. But, as in the other members of this family, there is a discrete ductus ejaculatorius; a local strengthening of the muscularis of each large seminal vesicle shortly before the entrance into the ductus ejaculatorius indicates where a false seminal vesicle may develop. The penis is large and fleshy, as is often the case in the Stylochids *Cryptophallus* and *Parastylochus*. The prostatic vesicle, the organ par preference having value for the classification of the Polyclads, shows unexpected indistinctness. As pointed out in the last chapter of this paper, the organ varies considerably in the Stylochids. But, as a rule, it is provided with a well-defined muscular envelope. In *Ilyplana* the fibres are loosely arranged, and it is impossible to establish a discrete limitation for the musculature belonging to the vesicle. It intermingles indistinctly with the fibres of the intromittent organ. In the loose grouping of the musculature, as well as in the appearance of the low epithelial wall of the vesicle and the feeble staining ability of the granular secretion, we get resemblances here to conditions met with in the Scandinavian *Discocelides*, whose relationship to the *Stylochidae* cannot be very distant. The distinctness of the muscular envelope of the prostatic vesicle of most Stylochids is partly due to the the location of it in the parenchyma, even if the dense interlacing of the fibres gives it a more pronounced appearance. But, when the prostatic vesicle is not removed from the penis, as in *Para-*

stylochus and *Cryptophallus,* we meet consequently with conditions which bridge over the gap between *Stylochus*- and *Ilyplana*-conditions.

The most striking feature in *Ilyplana* is undoubtedly the presence of cyanophile glands in the antral and penial wall. To this we have no correspondence in the previously described Stylochid-genera. It is, moreover, undoubtedly of interest to meet with just such glands in *Plehniidae* and *Polyposthiidae*, where I have described them in 1913 and 1923. *Ilyplana* is a very good example of how important it is to gain an increased knowledge of the Polyclad-fauna in the Indo-Pacific for a right estimation of the Polyclad-system. Taking, for instance, the three European genera *Discocelides, Cryptocelides*, and *Stylochus*, we find that they are very distinct types. *Polyposthia similis* from Scandinavia and *Plehnia arctica* and *japonica* bring the two former nearer each other. The numerous Indo-Pacific genera of *Stylochidæ* contribute to the abolishment of the isolation of *Stylochus.* None of them, however, approach *Discocelides* so much as the *Ilyplana* from New Zealand, which also agrees with it in respect to oecological habits. Nevertheless, to connect them more closely is perhaps too early at present, as a great many differences could be enumerated and we need yet more conclusive finds. The interesting *Plehnia japonica* will gain in importance for the Polyclad-system after the description of a new genus from the South Sea Islands. It really seems to be unavoidable to establish a new genus also for *Pl. japonica.* I wrote in 1923: »It would be easy to defend the placing of this new species in a separate genus«, but, in spite of that, I included it in *Plehnia* for the purpose of both emphasizing the relationship with *Pl. arctica* and avoiding the establishment of a new genus with only a single species, if no imperative necessity for it existed. This manner of proceeding, at that time of advantage and hardly incorrect, can, however, not be upheld, when we are getting acquainted with new Pacific forms demonstrating relationships to both the *Plehniidæ* and *Stylochidæ.*

Returning to *Ilyplana* and its relationships to *Stylochidae*, I must point out that the male organization perhaps most approaches that of *Parastylochus* and *Cryptophallus.* I attach then special weight to the prostatic organ.

The same is true of the tentacular rudiments and, to a certain

degree, of the arrangement of eyes. In the pharyngeal apparatus the difference is pronounced. In respect to the location of genital pores, we have, as already mentioned, an excellent agreement with *Stylochus*; it is further evident that it is less with *Cryptophallus* than with *Parastylochus*. The female apparatus demonstrates closest resemblance to *Parastylochus* and *Stylochus*. The existence of a readily overlooked string of cells, interpreted as a rudiment of a ductus vaginalis, indicates perhaps that the resemblance is of a somewhat problematic nature, and that too great weight cannot be attached to it. As I have earlier pointed out, great caution must be used in regarding the female apparatus as a clue to relationships.

From this little exposé it follows that *Ilyplana* is a Stylochid of less pronounced characters. Of the Stylochids hitherto described, *Parastylochus* and *Cryptophallus* can be regarded as having perhaps the nearest relationship to it. In respect to habitus and pharyngeal apparatus these two genera appear, however, as typical Stylochids. But, they are approaching the condition met with in *Ilyplana*, in their tentacles being insignificant.

The genus *Ilyplana* receives the following diagnosis:

Stylochids with a delicate body of elongated oval outline. Marginal eyes all around the body. Cerebral eyes in two clusters, and tentacular eyes few. Rudimentary tentacles. Pharynx of moderate size, approaches the brain. Intestine only branching and the coeca not densely gathered. Genital pores close to each other and near the posterior end of body. Small horizontal prostatic vesicle with undivided lumen. Penis large, fleshy, without penis-sheath. Cyanophile glands empty their secretion into the antrum masculinum. No seminal vesicle. Vagina short, without Lang's glandular vesicle.

One species from New Zealand.

Leptostylochus elongatus n. g. n. sp.

(Plate III, Figs. 11—16).

Locality: Underneath stones on the shore of Ponui Island, Auckland, New Zealand.

Material: Eight specimens preserved in formalin.

H a b i t u s: The body is elongated with its middle part of even breadth. The anterior end is rounded, while the posterior is very slightly extended, narrowing, and terminally rounded, not pointed. The figures 11—16 on Plate III show the characteristic shape, which mostly resembles that of the genus *Limnostylochus.* Thus it decidedly differs from that of the genus *Stylochus.* However, this shape possibly still more resembles the one characteristic for *Leptoplanidae* except for the fact that the post-pharyngeal part is shorter and less compressed. This has, of course, a direct connection with the considerable elongation of the pharynx.

For being that of a *Styloehid*, the body is very thin and the consistency is more similar to that of *Leptoplanidae* than that of *Stylochidae.*

Tentacular protuberances are present, but are so feebly developed that they can hardly be detected even with a lens. Consequently, the are merely small, barely noticeable swellings.

Pigmentation and pattern are also lacking on the dorsal side. Therefore, the preversed specimens have a whitish colour both on the dorsal and the ventral sides.

The pharynx is much more than a half of the entire length of the animal and is moved sligthly caudalwards. The pharyngeal pocket is very narrow, and has numerous shallow side-pockets (Plate III, Fig. 16). The mouth is situated at the border between the second and the last third of the body. Thus it is a little in back of the beginning of the last third of the pharyngeal pocket. (Plate III, Fig. 12).

M e a s u r e m e n t s: The longest specimen is 26 mm and its greatest breadth is 10 mm. The tentacles are in this case located 4 mm avay from the anterior edge of the animal and the distance between the tentacles is about $1^1/_4$ mm. The pharynx is $14^1/_2$ mm long. The genital pores are about half way between the mouth and the posterior edge of the body; the female gonopore is at a distance of $3^1/_2$ mm from the posterior edge of the body. Thus the genital pores lie very close to the pharyngeal pocket, as visible in text-fig. 11. The distance between the two pores is not more than $^1/_3$ mm.

A r r a n g e m e n t o f t h e e y e s: Marginal eyes are present only in the anterior half of the body. Forming one or two indistinct

rows, they are densely clustered in the first two-fifths of the body. They grow thinner at the beginning of the third fifth of the body and soon cease to exist entirely. It is significant that they are never smaller than the cerebral or the tentacular eyes. The cerebral eyes (text-fig. 10) are very numerous, about 300, and form a much elongated double cluster with the main mass of the eyes anterior to the brain. Two separate cerebral eye-clusters are distinguishable, although they have a tendency to fuse at their anterior ends. There is a distinct space between the cerebral and the marginal eyes (text-fig. 10). Consequently frontal eyes are totally absent. The tentacular eye-groups are insignificant — each consists of only 5—10 eyes — and lie close to the cerebral eye-clusters. A line connecting the tentacular rudiments would cross the posterior part of the brain. A significant feature is that the tentacular eyes are actually smaller than the cerebral eyes. This condition is no doubt due to the considerable reduction of the tentacles. A similar tentacular reduction is observed in *Neostylochus*, accompanied by a diminution in the number of tentacular eyes. However, in the case of *Neostylochus* their size exceeds that of the cerebral eyes. No doubt the tentacles in *Limnostylochus* have been even more reduced, since neither Stummer-Traunfels nor Kaburaki have observed any. However, it is not improbable that a sectional examination of *Limnostylochus* will show that they are not entirely absent. In my opinion one must rather

Text-fig. 10. *Leptostylochus elongatus* n. g. n. sp. Cerebral, tentacular, and marginal eyes. The brain and the circumferences of the slight prominences representing the tentacular rudiments are also drawn. 30 x.

expect to find in this genus also that the epidermis over the tentacular eye-groups will indicate the location of tentacular rudiments through the absence of gland cells.

Body-wall: The epidermis contains, especially on the dorsal side, a great mass of gland cells producing a granular, eosinophilous secretion. The rhabdit-cells, on the other hand, are neither ventrally nor dorsally present in excessive numbers, as is also the case with the basophilous gland cells. The frontal sense furrow is extremely near the anterior margin of the body, lying just subterminally. In association with this organ there are, besides the usual subepithelial, basophilous gland cells, some eosinophilous ones occurring together with the former.

For a number of Polyclads I have had an opportunity to describe a special kind of gland cells occurring in a submarginal zone around the body, in the epithelium, or in the peripheral parts of the body-parenchyma. Such glands do not occur in *Leptostylochus.*

The basement membrane is moderately thick and looks quite homogeneous. The muscle wall of the body is remarkably thin and does not exceed the epidermis in stoutness. This is at least true with regard to the dorsal side, and the middle and peripheral zone on the ventral side. It is perhaps superfluous to mention that the ventral epidermis does not attain the thickness of the dorsal, being about $^2/_3$ the height of the latter. It is of special interest that the outer „transversal“ muscle layer is so well pronounced that it stands out distinctly even on using a low magnification. The feeble development of this layer, usually consisting of only a single row of extremely fine transverse fibres below the basement membrane, has caused the earlier authors on Polyclads to overlook it. In *Leptostylochus* the fibres, at least most of them, meet each other in an acute angle, thus forming two diagonal layers, each two or three fibres thick. In other respects the normal appearance of the muscle layers occurs, but for the fact that the layers are remarkably thin. On the other hand, it is very noticeable that the dorso-ventral fibres are present in excessive number, being densely arranged in groups. The individual fibres are also very coarse.

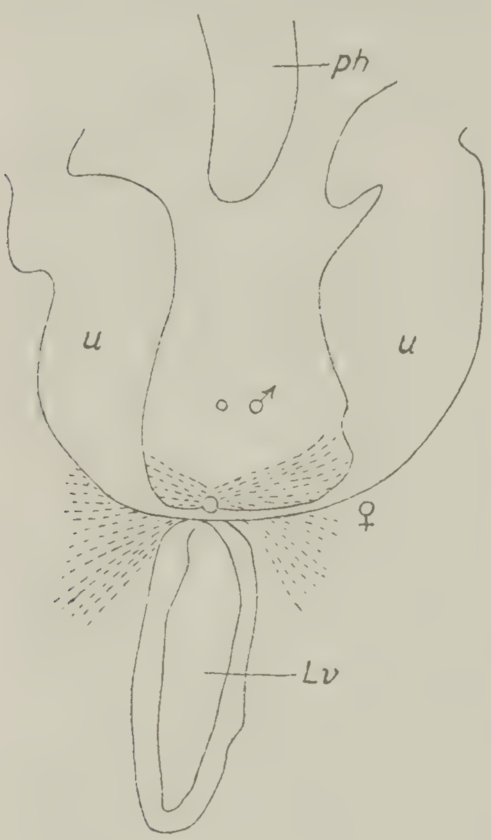
Alimentary system: The mouth lies approximately at the beginning of the last fifth of the pharyngeal pocket. The pharynx is extremely richly folded and fills up the pharyngeal pocket rather

well. The basophilous pharyngeal gland cells occur in especially great abundance. They empty their secretion, very deeply stainable, by means of densely arranged exits on both sides of the fold. The eosinophile secretion, on the other hand, is conveyed to the free edge of the fold. It deserves to be mentioned that large accumulations of emptied secretion, which contain an intermixture of both kinds of secretion are present in the pharyngeal pocket. This chamber connects with the main gut by means of a large centrally placed opening. The diaphragm is thick and very muscular. As the pharyngeal pocket takes up most of the space inside the muscular wall of the body, the main gut is a dorso-ventrally depressed tube; nor is its transverse diameter great. A great number of intestinal coeca are given off from the long main gut and they branch moderately but do not show any anastomosis. The side branches are of special interest, as they form deep pouches on their ventral side. The assimilation of the food is mainly carried on in these pouches, while the dorsal wall of the coeca does not appear as a syncytial mass. Thus we have here a differentiation of the branching system of the intestine in distributing canals and from these projecting ventral thickwalled pouches, where the later stages of digestion work can be continued undisturbedly.

Genital organs: Ovaries as well as testes lie dorsally, and are intermixed. However, there is a certain tendency in the testes to lie more ventrally, although numerous testes may extend as high as the ovaries; that is, reach the dorsal muscular wall of the body. Thus the genital glands are situated between this musculature and the intestinal coeca, and, consequently, are exclusively in the dorsal half of the body. As a matter of fact, this dorsal location of the testes is a very unusual feature in Polyclads. In *Acotylea* it is found in a few Leptoplanids, and in the family *Stylochidae* Laidlaw has found a similar location in some *Stylochus*-species. His attempt (1903) to use this feature as a basis for classification of the genus in question, so rich in species, has been rejected by Meixner (1907). In *Leptostylochus* the dorsal location of the testes establishes the possibility for the intestinal branches to have numerous ventral projections. This fact and the dense grouping of the intestinal coeca can probably be considered the real reason for the concentration of the genital glands into one single dorsal layer. The gonads are

absent, not only over the pharyngeal pocket but also in the zone immediately adjacent, which is due to the exclusively dorsal location of the roots of the intestinal coeca. The ovaries are likewise missing in the broad marginal zone where the body is rather thin. Both testes and ovaries are very large and the germination centre has in the latter a dorsal location.

Both large seminal canals lie as usual ventrally and run their customary winding course directly caudalwards. Before they turn towards the median line in the region of the male copulatory organ, the musculature increases and soon becomes so thick that a false seminal vesicle is developed. The vesicle narrows off during its course toward the median line and becomes a constricted muscular duct which opens up into the slightly expanded rostral part of the ductus ejaculatorius. The development of the two lateral false seminal vesicles is not so pronounced as in *Discostylochus*, and this fact is striking proof that false seminal vesicles originate only through local increase of the musculature of the large seminal canals. In *Leptostylochus* it is, as a matter of fact, impossible to set a distinct proximal limit for the seminal vesicles. Their muscularis is compact with a nucleated zone that forms its outer envelope.



Text-fig. 11.
Leptostylochus elongatus.
Lang's gladular vesicle (Lv), sexual pores, hinder parts of uteri (u) and pharynx in ventral aspect. The interupted lines indicate the shell glands. 21 x.

The male and female copulatory organs are close to each other and the genital pores (text-fig. 11) are near the posterior end of the pharyngeal pocket.

Ductus ejaculatorius (text-fig. 12, de.) is slightly expanded in its proximal end, where the two efferent ducts from the seminal vesicles enter it. The first-named duct is short, and located at first underneath the prostate vesicle. Its thick muscular envelope fuses further distalwards with the muscularis of the duct of the prostate vesicle. The two epithelial tubes, on the other hand do not fuse until near the „apex penis“.

The prostate vesicle (pr.) measures only 0.4 mm, a dimension that is rather small, both absolutely and relatively, for that of a Stylochid. It has a club-like shape, and is thickest in its rostral blind end. Without any distinct limit, it merges caudalwards into the short straight efferent duct. Consisting of sparse fibres, the muscularis is remarkably thin. This inconsiderable muscular wall is pierced by wide gatherings of the efferent ducts from the extracapsular gland cells. Through its slight affinity to eosine the extremely fine-granular secretion from these ducts differs decidedly from the somewhat coarse-grained prostatic secretion from the intracapsular gland cells. The intracapsular gland layer forms a large number of short tubes that empty into the middle lumen of the vesicle.

The antrum masculinum is short and in its upper part is filled by the short „plug-like" penis. Penis-sheath (= „Penisscheide") and stylet is lacking.

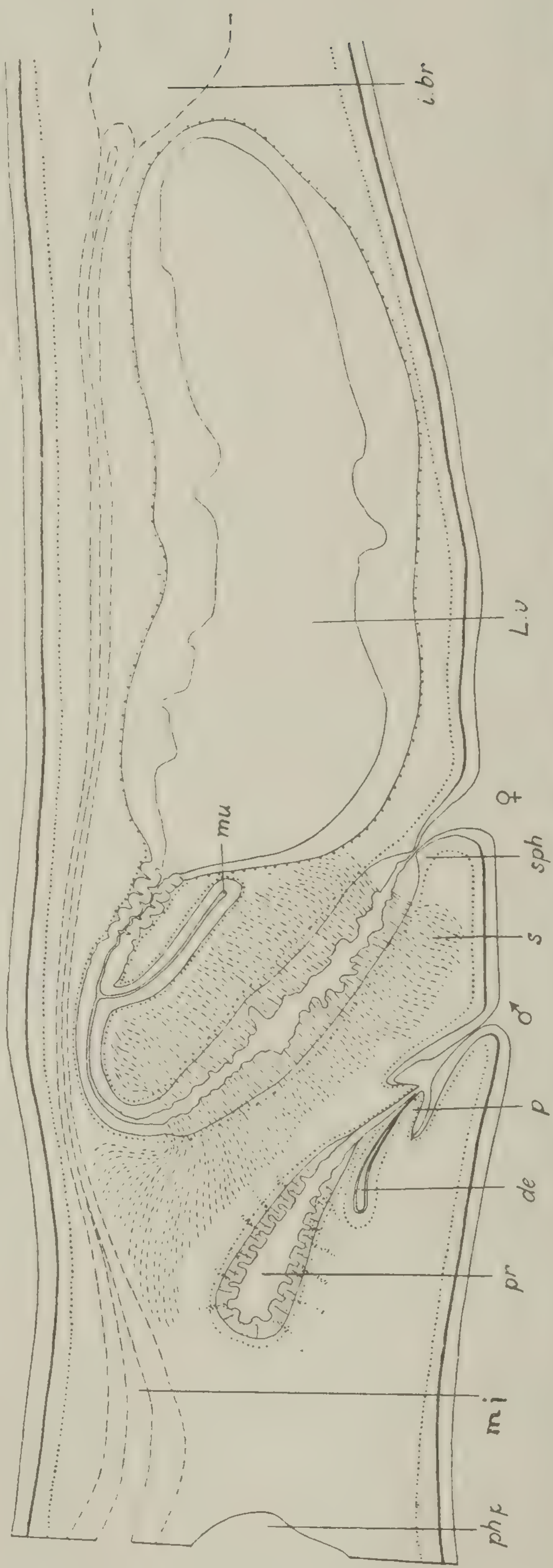
It might be mentioned here that on Yeri & Kaburaki's figure of the copulatory apparatus in *N. fulvopunctatus* the shell glands are indicated as having openings into the duct of Lang's glandular vesicle, an error that must have originated in the use of staining agents, which has made it impossible to secure a clear conception.

The uteri are a pair of very long, wide, and dorso-ventrally winding canals, which originate already in the prae-pharyngeal zone slightly back of the level of the brain. Filled with eggs as much as 160 μ long, the uterus-loops may reach both the dorsal and the ventral muscular body-wall. A pregnant specimen may at a time have approximately over a thousand eggs in the uteri.

Although the male apparatus is small, the female one is extremely well-developed. The main gut, which continues over the latter, is consequently compressed into a very narrow tube (text-fig. 12). The most striking feature is the good-sized Lang's glandular vesicle. The vagina is also well-developed, especially in regard to the shell gland duct, which is a wide tube, the epithelial covering of which sends out numerous ridges into the lumen. One particular feature in the organization of the vagina is a special muscle sphincter slightly inside the genital opening. On account of this one might consider the outer part an antrum feminium. Its epithelium is glandless and diminishes in height towards the inner end. Near the place

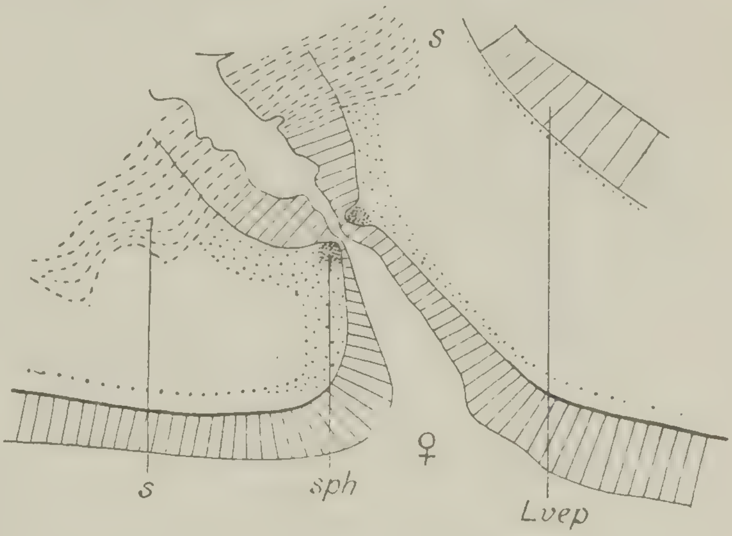
where the sphincter is situated, it becomes very low. Immediately thereafter the epithelium of the vagina increases so much in thickness that it may exceed the epithelium of the body to quite a considerable degree. The shell glands are spread out over the post-pharyngeal section of the body and empty as compact masses into the distended part of the vagina. As text-figure 13 shows, they do not in this case reach the narrowing of the sphincter. The great mass of shell glands is certainly connected with the large production of eggs. The wide shell gland duct that comprises the longest part of the vagina indicates that in all probability more than one egg is enclosed in each egg-capsule. Such a condition is not unusual in *Planoceridae*, but is unknown in *Stylochidae*. On account of the organization of the vagina, a similar feature cannot be expected in the genus *Stylochus*, and my observations of the deposit of the eggs in a couple of *Stylochus*-species confirm this opinion.

The glandless pars interna vaginae has the ordinary diameter and comprises the curving tube and the inner



Text-fig. 12. *Leptostylochus elongatus.* Sagittal section through the genital apparatus. 60 x. de, ductus ejaculatorius; i.br, intestinal branch; Lv., Lang's glandular vesicle; mi, main intestine; mu, entrance of the uterine canals into the unpaired uterine canal; p, penis; php, pharyngeal chamber; pr, prostatic vesicle; s, shell glands; sph, muscle sphincter in pars interna vaginae.

caudalwards directed part of the vagina. The median uterine duct (Text-fig. 12) has a considerable length and is directed forwards. The uteri open into it immediately before Lang's glandular vesicle. Thus the duct to this vesicle is not longer than the median uterine duct. Because of the development of sphincter muscles, the epithelial tube, especially nearest the vesicle, has a beadlike appearance, while the compact outer muscular envelope, composed of circular and longitudinal muscular fibres, has an even contour as in pars interna vaginae.



Text-fig. 13. *Leptostylochus elongatus.* Outer part of the vagina; sph, muscle sphincter; Lvep, epithelial wall of Lang's glandular vesicle.

Lang's glandular vesicle (Lv.) is an elongated oval, and, as the figures show, reaches a considerable size. Within the family it particularly resembles that of the genus *Neostylochus.* Its location near the vagina deserves to be mentioned.

In one specimen the vesicle contains only a pulpy mass of granules stained with hematoxylin. In another specimen there are masses of sperma and egg-remnants. The contents seem to be in a state of disintegration. The wall of the vesicle has a distinct muscularis.

Summarizing what has been said, we may say that the female apparatus in *Leptostylochus* is characterized by a more advanced differentation of a type already present in *Neostylochus.* The splendid development of the shell duct and of Lang's glandular vesicle should particularly be remembered, as well as the presence of a special muscle sphincter in the distal end of the vagina.

Within the family *Stylochidae,* the following genera possess a Lang's glandular vesicle: *Neostylochus, Idioplana, Idioplanoides,* and *Limnostylochus.* The last two, with respectively 2 and 3 species, have a Lang's glandular vesicle that is horseshoe-shaped. Aside from the differences mentioned, we find the closest resemblance in the female apparatus of *Neostylochus.* The male apparatus in *Neostylochus* is, on the other hand, different in that the penis is armed with a stylet, penis-sheath is present, as well as a true

seminal vesicle, and the prostate vesicle is unchambered; i. e. the lumen is undivided. Besides, *Neostylochus* has eyes scattered over the entire anterior end of the body, distinct tentacle rudiments, and testes and ovaries ventrally and dorsally respectively.

In addition to a dissimilar shape of the body and arrangement of eyes, *Idioplana* and *Idioplanoides* have well-developed long tentacles and a vagina that extends over and far anterior to the male apparatus. In both cases the prostate vesicle has a simple organization, with radiating tubes lacking, a true seminal vesicle is present, and the testes have a ventral location. *Idioplana* has a minimal Lang's glandular vesicle with a long duct, while *Idioplanoides* has a paired Lang's vesicle with likewise a long duct. *Leptostylochus* is probably most closely related to these two genera. *Limnostylochus*, with one fresh water species and two in brackish water in south-eastern Asia, seems to me to be more dissimilar, so that I shall simply refer the reader to Stummer-Traunfels' and Kaburaki's descriptions.

The new genus receives the following diagnosis: Stylochids with thin and delicate body. Marginal eyes only in anterior half of body. Separated cerebral eye-clusters and few tentacular eyes. Frontal eyes absent. Tentacles rudimentary. Pharyngeal apparatus exceedingly elongated and narrow, with small side-pockets. Intestinal coeca with ventral projections. Gonads intermixed dorsally. Genital pores close to each other. Penis small, unarmed, and without penis-sheath. Chambered prostatic vesicle and two false seminal vesicles. Vagina moderately long, with muscle sphincter and expanded shell gland duct. Lang's glandular vesicle unpaired and large. One species from New Zealand. Another species has been collected by myself at Sydney.

Cryptophallus sondaicus nov. spec.

(Plate III, Figs. 18—21; Plate IV, Figs. 25—28.)

Locality: Amboina. On stony beach.

Material: The only specimen at hand was collected together with *Discoplana subviridis* (Plehn) Bock and *Stylochus marmoreus* n. sp. February 10, 1922, and preserved in formalin.

Habitus: The animal differs from *Stylochus* in its more elong-

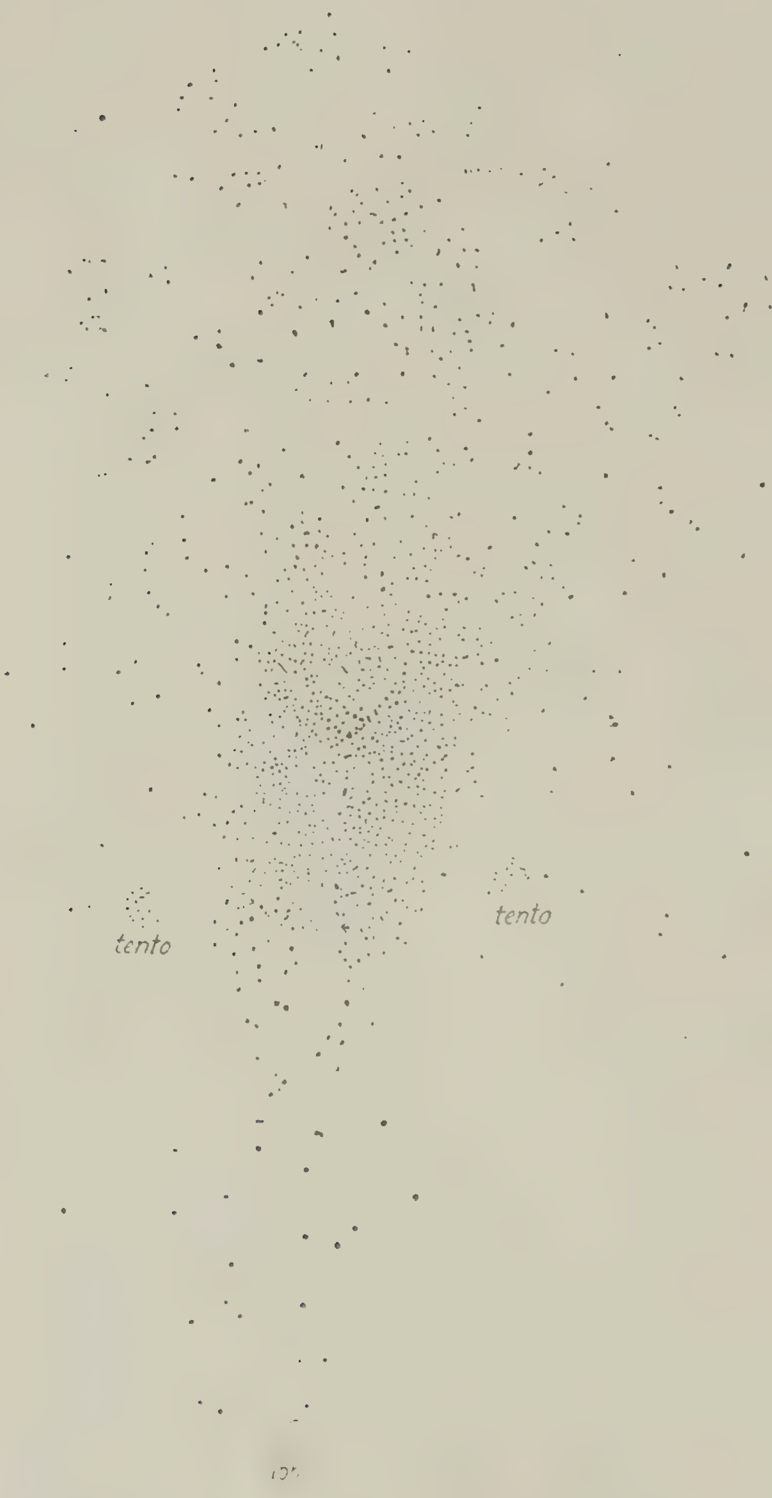
ated oval shape (Plate III, Fig. 18), its more moderate thickness, and its nicely extended condition when preserved; that is, it is not rolled or folded. The same condition is met with in *Cr. wahlbergi* Bock. The absence of well-developed tentacles definitively shows that it does not belong to the genus *Stylochus*.

The upper side of the body has (in the preserved state) a very even, homogeneous, dark grey-brown colour without concentration of the shade toward the median line. The colour belongs to the epidermis and is dependent upon the presence of the glandular secretion, which in the formalin-preserved animal shows such a tint. The outer margin of the body and the very low tentacular protuberances are colourless. The marginal eye-band was already easily discernible on the specimen in formalin by means of a lens. The under side of the body is lighter brown, as the amount of epidermal gland cells is somewhat sparser.

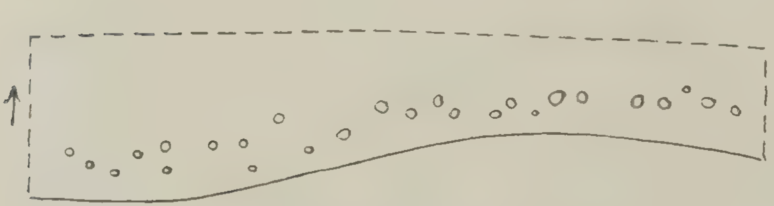
The tentacles are present only in the shape of extremely small knobs, and can be perceived as insignificant prominences by means of a strong lens or in the microscope. On account of their glandless epithelium, they are visible on Plate III, Fig. 18 as two light spots.

Measurements: The length of the body is 40 mm., and its greatest width $20^{1}/_{2}$ mm. The tentacular rudiments are 8 mm. from the frontal end and 1,6 mm. apart. The mouth is 28 mm. from the anterior end. Pharynx begins 10 mm. from the frontal end of the body and is nearly 24 mm. long. Thus the post-pharyngeal section is only $6^{1}/_{3}$ mm. The female gonopore is 4 mm. from the caudal end of the body and $3^{1}/_{3}$ mm. back of the male opening. The latter is, moreover, 1 mm. in front of the caudal end of the pharyngeal pocket.

Arrangement of eyes: Text-figure 14 shows the arrangement of cerebral and tentacular eyes. It should particularly be emphasized that the marginal eyes are unusually numerous and are found around the entire body, being also frequent at the caudal end (text-fig. 15). Many eyes are present over the entire anterior end of the animal, and posteriorly they extend to the pharyngeal pocket. Frontal eyes are arranged in scattered groups or detached and are most frequent in the median part. The tentacular eye-groups (text-fig. 14, tento) are well marked off and each consists



Text-fig. 14. *Cryptophallus sondaicus* n. sp. Cerebral and tentacular eyes. The latter are indicated with the letters *tento*. Anterior end of pharynx (ph). 16 x.



Text-fig. 15. *Cryptophallus sondaicus*. Marginal eyes at the extreme posterior end of the body. 45 x.

of about 20 ocelli. The cerebral eyes form a compact mass in which, however, one may with some difficulty distinguish two scarcely separated groups. Anteriorly the cerebral eye-mass breaks up into various groups and cannot with any certainty be distinguished from the frontal eyes. As in *Cr. wahlbergi*, the mass of cerebral eyes lies for the most part in front of a line connecting the two tentacular rudiments.

As the above descriptions show, the divergencies from *Cr. wahlbergi* Bock in respect to the external appearance are not very great. The two species can most easily be distinguished through the different shape of the body (Cf. Bock 1913, Taf. III, Fig. 8 and the accompanying figure, Plate III, Fig. 21) and the arrangement of the eyes. In addition there are numerous minor differences in the inner organization that argue in favour of at least a tentative separation of the species of *Crystophallus* found in the Malayan archipelago from *Cr. wahlbergi* occurring in South Africa (Port Natal). In any case, however, at present the conditions at hand do not entitle me to class the two forms in the same species. In this

regard I refer to Meixner's (1907, pp. 144—147) treatise on »die geographische Verbreitung der Stylochinen« and his conclusion: »So kommt es, dass nach unsern heutigen Kentnissen jede Küstenpartie ihre besondere Stylochinen-Formen zu haben scheint«. His additional statement, „aus diesem Grunde ist mir neulich zweifelhaft geworden, ob ich recht getan habe, den unzureichend beschriebenen *St. reticulatus* Stps. aus dem Japanischen Meere mit der von mir beschriebenen Form von der Somaliküste zu identifizieren«, can indeed be considered justified, for I might call to mind the fact that Yeri and Kaburaki (1918) have identified Stimpson's „*Stylochus reticulatus*"[1]) as a *Planocera* = *Pl. reticulata* Stimpson from Misaki, in full accordance with Lang 1884, p. 455. Here I may add that in a recent paper Dr. Frieda Meyer describes a Polyclad from Koseir in the Red Sea under the title *Stylochus reticulatus* Meixner? As far as I can gather from her description and figures, this form does not belong to Meixner's species. She does not mention the occurrence of the characteristic pattern »aus umbrafarbenen Netzwerk« of the latter species, but notes only that the colour of the dorsal surface is „dunkelbraun" and when the epidermis is removed, „hellbraun". It would be too long to compare the two forms in detail here, but this much can be said that already the location of the mouth, near the end of the pharyngeal pocket, and the sexual pores speaks against an identification.

According to the rules of nomenclature, the name *reticulatus* Meixner cannot be maintained, and I shall therefore substitute for it *Stylochus meixneri* n. nom. For Meyer's species I might here propose the name *St. coseirensis* n. nom.

Body-wall: It has already been mentioned in the case of *Cryptophallus wahlbergi* Bock 1913 that the epithelium is extremely rich as to glands, but lack of space has prevented any detailed information. In the species under consideration, the dorsal side has

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[1]) The identification of Stimpson's species might of course only be of more or less problematic nature. In the present case I might regard the undertaking of the Japanese authors as quite correct. In this connection I must warn against identifications founded solely upon poor verbal descriptions of animals from widely separated localities. Only the greatest caution in the determination is of value for a true knowledge of the geographical distribution of the species.

a much greater proportion of secretion than the lower epithelium on the ventral side. The kind of gland cells that particularly gives the epithelium its characteristic appearance has a slender shape and contains an acidophilous secretion. It consists of clots of irregular shapes. Stained with Ehrlich's hematoxylin + eosin, this secretion assumes a peculiar dark dirty-red colour. The dark shade in the stained sections is due to the secretion's own colour which causes the earlier mentioned brown colour of the animal's body. I have previously pointed out how the dorsal epithelium in the case of *Meixneria* abounds with masses of gland cells that contain a black-brown secretion with large irregular-shaped clots (Bock 1913). In *Cryptophallus* we have a distinctly related type of gland, but the secretory clots are here much smaller. The gland cells are entirely filled with them. As a result of the immense number of gland cells, the production of this secretion must be enormous. At the same time the scarcity of rhabditi in the epithelium rather surprises one. Under such conditions it seems likely to attribute a function similar to that of the rhabditi to the mentioned secretion, which would then have brought about a reduction in the quantity of rhabditi. It seems, as it were, as if the production of rhabditi were disappearing and thus only rudimentary. The cells carrying rhabditi are indeed so few that one must directly search for them. The rhabditi are only 6 μ long and up to 2 μ thick, and are more rod-than spindle-shaped, with rounded ends. Stained as above, they assume a clear, lustrous scarlet colour. Arranged in bundles, they occur exclusively in the outer quarter of the dorsal epithelium. On the ventral side with its lower epithelium, they are found in its outer half. They are here even more scarce than dorsally. The mucous cells are, on the other hand, less frequent on the dorsal than on the ventral side and do not occur in any great number. Efferent ductuli from the gland cells located in the sub-epithelium are, furthermore, found in the epithelium, and these carry a pronounced cyanophil secretion. The short and finely ciliated supporting cells of the epidermis have as usual a disc spread out toward the free surface; the compressed outer parts of the gland cells are located between these cells. Fibres that are very well stained with hematoxylin are distinguished in the basal fourth of the epithelium. The basement membrane is on the outside studded with these delicate rods, not much thicker than the cilia.

The basement membrane is 5 μ thick, homogeneous, stained with eosin, and has an outward border of a distinct fine membrane stained with hematoxylin.

The muscular wall of the body is still more feebly developed than in *Cr. wahlbergi.* On the ventral side it reaches only the height of the ventral epithelium, while on the dorsal side it is, of course (through the absence of an inner longitudinal muscular layer), still thinner. The muscle fibres are, on the other hand, coarse and densely packed. The muscularis of the body found in the parenchyma compensates for the inconsiderable thickness of the muscular wall of the body. As a matter of fact, besides the usual very robust dorso-ventral muscular bundles, so many muscular fibres, running in different directions, are present that the tissue between the intestine and the compact musculature looks more like a sparse muscular tissue than a parenchyma. The fibres are as much as 4 μ thick and contain coarse fibrilles.

Sparse pigment cells with brownish-black granules are present in the muscularis and the underlying tissue. It should be emphasized that they also occur, though less frequently, on the ventral side of the body. However, on account of the colour of the epidermis, these do not appear, at least on the preserved animal, as a pattern.

Excretory system: The discovery in this animal of numerous coarse, branched excretory ducts was indeed unexpected, as they have hitherto not been observed in any Polyclads in the state of preservation. Moreover, only Schulze and Lang have noted them in living Polyclads. Therefore, I am giving my observations below, although the preservation does not allow any details as to the fine capillaries and the terminal cells.

The large efferent excretory canals occur in great numbers in the tissue between the ventral musculature and the intestinal system. The stoutest trunks may reach a thickness of 10 to 20 μ. Thus they can easily be followed from section to section. These canals subdivide, and, as can be seen, the branches form a network with swellings to the above maximum thickness occurring here and there. Short efferent ducts running in a ventral direction proceed from these canals (Plate IV, Figs. 25—28). These latter ducts can without difficulty be discerned even during their course through the

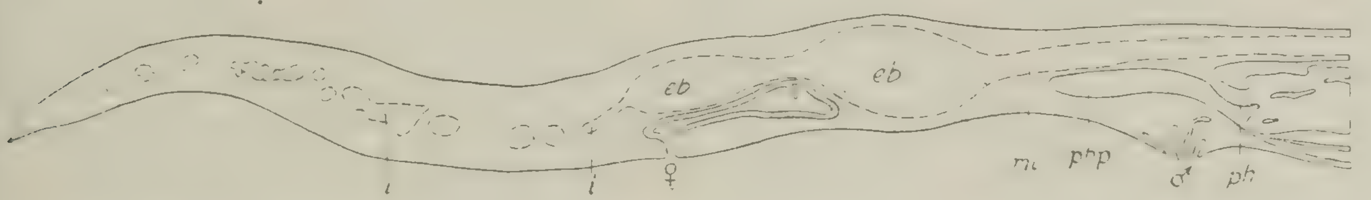
muscle layers of the body-wall. They suddenly become thinner near the basement membrane and have then a diameter of only 4 μ. Here they also begin to coil, with the result that it is quite difficult to trace them and follow them from section to section. On account of the formalin preservation used, the epidermis together with the basement membrane has almost everywhere in the middle of the body come loose from the muscularis (cf. Plate IV, Figs. 25—28). Therefore, it is very difficult to find the correct places where these efferent ducts fit into the epithelium. However, somewhat thicker canals than those of the efferent ductuli from gland cells embedded in the parenchyma have been distinguished in some cases in the basement membrane and the epidermis, and these may possibly represent the end-parts of the excretory canals. It might be mentioned that exits for the excretory canals have not been observed to date in the Polyclads (see for instance Lang's description of the excretory system of *Thysanozoon*, p. 166).

The outline of the large excretory canals is distinct and there is a delicate membrane stained with hematoxylin. This marked membrane may of course also be visible from the flat side. Nuclei of the wall of the canals occur only here and there and with very large intervening spaces. On account of the preservation the plasma lining of the canals appears indistinct and it is often impossible to discern it. On the other hand, the fine cilia found projecting into the lumen of the canals can easily be observed. Judging also from the exits of the cilia, the plasmatic wall is very thin. In this plasmatic wall of the canal one may occasionally see scattered gatherings of light grey-blue granules which perhaps represent excretory products.

I should attribute the splendid development of the excretory system in this species to the fact that the muscularis present in the parenchyma is so robust. This rather compact musculature has increased the demands on the metabolic processes of the body, which has necessitated a better organized excretory system than that usual for the Polyclads. It would probably not be quite unreasonable to suppose that a water current in these canals would be of importance for the supply of oxygen to this musculature.

Digestive system: Regarding pharynx, I shall only refer to Plate III, Fig. 20 and point out that the pharyngeal fold running

into the side-chambers of the pharyngeal pocket is attached to the walls of these chambers. Plate III, Fig. 19 shows that the alimentary system has numerous branches, and also that the beadlike intestinal branches are densely gathered. These, moreover, send out projections both to the dorsal and the ventral sides. These partly separated sacs have above all an assimilatory function. Some oval dark bodies of quite a considerable size may be seen on Plate III, Fig. 20 (cb). These merely represent excremental masses that are stored in the lumina of the intestinal coeca (text-fig. 16). In order to accommodate these gatherings, the gut has expanded



Text-fig. 16. *Cryptophallus sondaicus*. Combined diagram representing a sagittal section of the posterior part of the body. 16 x. eb, excremental ball; i, intestinal branch; mi, main intestine; ph, pharyngeal fold; php, pharyngeal pocket.

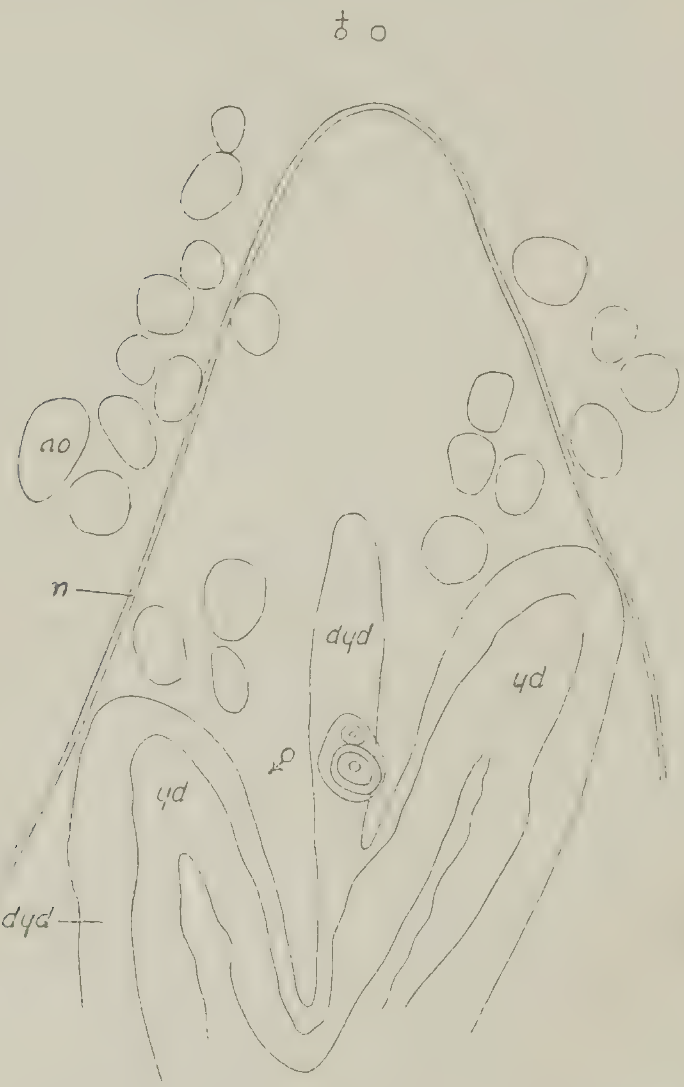
enormously, and the intestinal epithelium is very low and shows neither secretory nor assimilative features. Otherwise the intestine indicates a most abundant intracellular digestion.

F e m a l e g e n i t a l o r g a n s: As in *Cr. wahlbergi*, the ovaries lie dorsally. They are still minute, as the oocytes as yet lack yolk-granules. The oviducts proceed from the dorsal side of the ovaries and form thick canals arranged somewhat like network. Although the ovaries are so immature, the oviducts possess a distinct lumen.

Uteri are present in the form of two long coiling canals, which do not branch as in certain *Stylochus*-species.

The female apparatus is principally similar to that of *Cr. wahlbergi*, thus equipped with ductus vaginalis lacking an outer opening of its own. A short antrum femininum leads directly upwards from the female genital pore. This distinctly represents a dilatation. The vagina proceeds from its anterior wall, while ductus vaginalis issues from its upper end. The vagina runs straight forwards parallel to the ventral side of the animal, later approaches this side still more, then makes a sharp curve upwards and backwards. This ventral limb of the vagina is longer than that of *Cr. wahlbergi*. The lumen of the vagina changes its shape after the curve has been made. Its former tubular shape now becomes twisting. This

is directly connected with the change in the epithelium; the muscular wall and the basal membrane remain unchanged. On account of the difference in height of the epithelial cells, a spiral-shaped ridge protrudes into the vagina, and thus we have here a decided similarity to the condition met with in *Bergendalia anomala* Laidlaw and *diversa* Yeri and Kaburaki. Laidlaw says (1903 a, p. 312): „The female apparatus is no less remarkable than that of the male. The vagina, va., runs forward for some little distance from the aperture, then turns upwards. As it does so, it is twisted into a remarkable spiral coil, making some five complete turns. It then runs backwards, narrows considerably, and soon receives the openings of the two uteri, ut, on its ventral side. Beyond this point it is continued back as a narrow accessory vesicle, acc. ves., about as far as the level of the female aperture, when it turns sharply ventralwards and opens to the exterior by the antrum.“

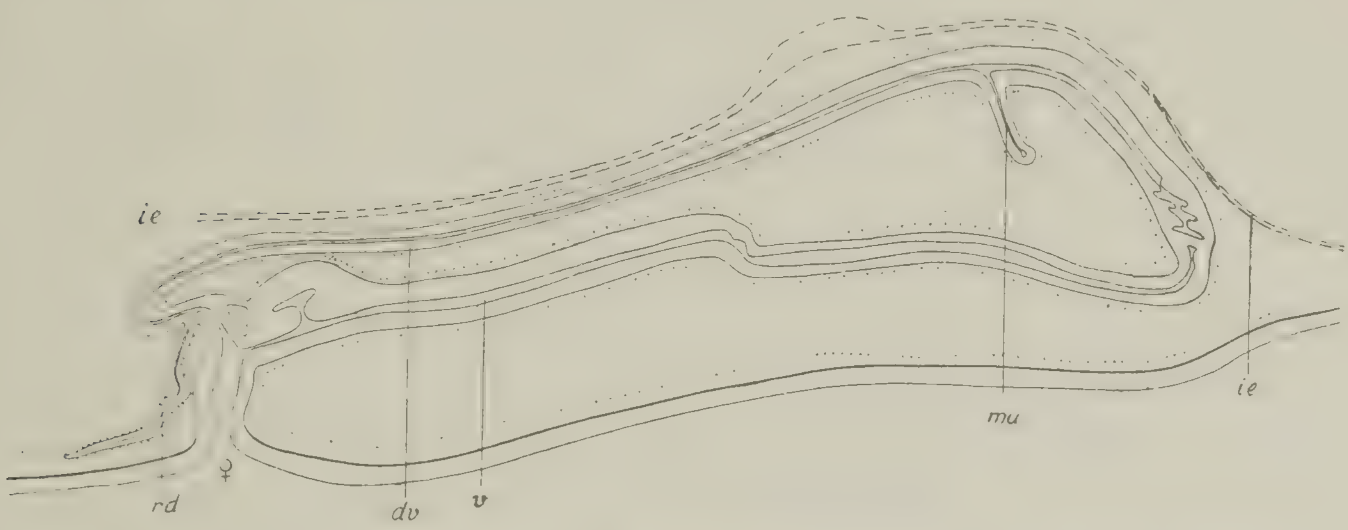


Text-fig. 17. ***Cryptophallus sondaicus.*** **Posterior part of the pharyngeal pocket. php, with pharynx; ph, the course of the young uteri; u, the ovaries; ov, and the sexual openings. 21 x.**

„The rest of the terminal female ducts are precisely similar in character to the first part of the vagina, only narrower. There seem to be no special shell-glands present.“

Yeri and Kaburaki state (1918, p. 10) that the vagina in *B. diversa* „proceeds obliquely forward and upward for some distance, being twisted at a part of its course into a compact spiral coil of some five turns (S.). It then proceeds backward gradually narrowing, and is soon joined on the ventral side by the single uterine duct coming from behind.“ Judging from the schematic text-figure, a „spiral coil“ seems to have arisen here in a way similar to that in *Cr.*

sondaicus, in that a spiral-shaped ridge has been caused by the different heights of the epithelial cells. In *Cr. sondaicus* shell glands empty into this section of the vagina. These glands have not been developed in any great number, but scattered and very long secretory ducts coming from quite a distance are found. The secretion contains very small corpuscles, only 1 μ, and has, when stained with eosin, assumed the same clear scarlet colour as the rhabditi.



Text-fig. 18. *Cryptophallus sondaicus*. Female apparatus in longitudinal section. Diagram combined from numerous sections. 65 x. dv, ductus vaginalis; ie, wall of the main intestine; mu, median uterine canal; rd, rudimentary duct in connection with the ductus vaginalis; v, vagina.

One must presumably agree with Lang in considering these glands as genetically derived from the rhabditi glands. The median uterine duct enters the vagina at its highest point; that is, shortly after it curves. This duct runs directly dorsally and is longer than that of *Cr. wahlbergi*. Thus the ductus vaginalis forms the direct continuation of the vagina backwards, meanwhile also approaching the ventral side of the body. It might be mentioned that in my specimen the duct in question soon turns slightly aside, because at that place the gut is very much dilated on account of a ball of excrement. This displacement has caused the distal end of the duct to curve back here toward the median line. This curve, however, reaches the region back of the genital pore first, so that in its most distal course the ductus vaginalis again runs in a forward direction. Text-figure 18 does not show the sideward bend of the vagina and ductus vaginalis; consequently the ductus vaginalis appears too short.

An anomalous formation that might be mentioned in passing is

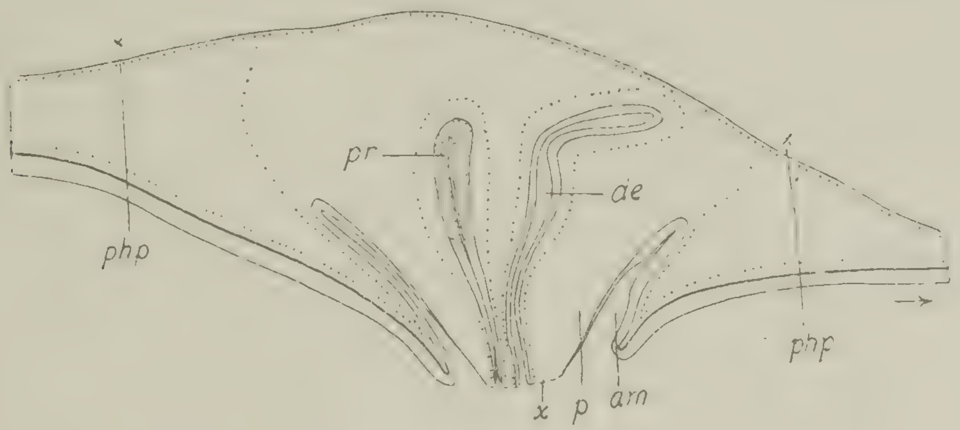
that above the antrum the vagina and the ductus vaginalis are connected by a solid string of epithelial cells.

Still another thing should be mentioned. From the distal end of the ductus vaginalis runs an epithelial tube which, surrounded by muscularis, runs in a backward-downward direction. It approaches the outer part of the antrum so that their muscularis partly fuse. Then the tube bends backwards and draws near to the muscular wall of the body. Here a solid string of epithelial cells continues into the musculature, which it traverses obliquely, reaching finally close to the basement membrane. This is, of course, a formation that has no function, and might be interpreted as having developed during the attempt of the ductus vaginalis to reach the surface of the body. It might, of course, be an atavistic feature, and that consequently this organ represents a formation of rudimentary nature, showing us that perhaps the ductus vaginalis has had its own opening caudally to the genital pore. In any event, the development of the duct is, though slight, a foundation for the conception that the ductus vaginalis has been derived from the duct of Lang's glandular vesicle. One might interpret the duct as being derived from the condition that the inner continuation of the vagina, which is without doubt the duct of Lang's glandular vesicle, runs directly downwards in an attempt to reach the ventral wall of the body and eventually the genital pore.

In the case of this individual, this development might be interpreted as an unsuccessful attempt on the part of the ductus vaginalis to reach the genital pore, but for my part I wonder if it would not be quite reasonable to interpret it as a rudimentary organ, showing that the very existence of a begining of ductus vaginalis would indicate that the duct of Lang's glandular vesicle has attempted to become connected with the ventral wall of the body. The present case gives support to the theory discussed in a previous report (Bock 1925 a) that the ductus vaginalis represents a secondary arrangement and that the duct of Lang's glandular vesicle is adapted for the purpose of establishing a connection outwards. The hindmost part of the canal mentioned would thus probably answer to an almost completely reduced Lang's glandular vesicle.

Male genital Organs: The testes lie just above the ventral

muscular wall of the body. The large seminal canals have not been examined as to their whole course, but are located in the transverse section slightly back of the mouth, close to the uteri, and a short distance laterally to the pharynx. In the distal part they run their usual twisting course under the pharynx. With the



Text-fig. 19. *Cryptophallus sondaicus.* Sagittal section of the male copulatory organ. 68 x. am, antrum masculinum: de, ductus ejaculatorius: p, penis; php, pharyngeal pocket; pr, epithelium with granular gland cells; x, interrupted line indicating that the apex of the penis is lacking owing to damage, probably caused during transport.

musculature increasing in stoutness, they develop into elongated false seminal vesicles. The ciliated epithelium of these vesicles is high. They are located in the transverse section of the animal. The muscularis is principally arranged in circles and increases in thickness gradually. Hence they do not give a very distinct impression of separate organs. Distally toward the entrance to ductus ejaculatorius the muscularis decreases somewhat in robustness. They merge into one another in the median line a short distance anterior to the base of the penis, although they are shifted so far forward that they nearly reach the level of the anterior border of the antrum. Ductus ejaculatorius runs from the place where the two join a short distance caudally, then anterior to the longitudinal axis of the penis, through which it later traverses the said organ. The musculature of the duct decreases in thickness towards the apex of the penis. As the series of sections shows, the differentiation of the false seminal vesicles has not gone very far. This may partly be due to the fact that full sexual maturity has not been reached, but one might also assume that the genital apparatus, as regards the organization of seminal vesicles, constitutes a middle stage between the condition in species of *Stylochus* with three-

limbed seminal vesicle and *Parastylochus,* and still more so as in *Discostylochus* with its well pronounced separated false seminal vesicles. In *Cryptophallus* it is evident that false seminal vesicles are being developed, because of the local increase in thickness of the muscularis in the end-parts of the large seminal canals.

Back of the axis of the penis lies the prostatic vesicle. It has almost a vertical position with the free proximal end protruding above the base of the penis. Its efferent duct forms the direct and straight continuation of the vesicle. The efferent duct is characterized by a decrease in the stoutness of the muscularis and by the fact that the epithelium becomes lower and glandless. Thus it is a considerably simpler type of organization than that in *Stylochus.* Consequently the vesicle and the efferent duct form a club-shaped organ with a proximal dilatation. The vesicle looks as if it were yet in an immature stage, but its epithelium, with a few quite small folds in the proximal part of the vesicle has densely packed gland cells in a pronounced secretory state. The outer circle of gland cells is expanded like a club and has developed into a secretory cup. The prostatic secretion has a decided staining ability with eosin, but assumes a somewhat dirty red shade. Only a few scattered extracapsular gland cells could be discerned with certainty, but this might partly be due to the immature state of development of the organ.

As in *Cryptophallus wahlbergi*, we have here a wide conical penis which has a vertical position in an antrum masculinum that has been reduced to a fissure-like room or chamber. Also here the penis with its organs is located in a thickened ridge which forms a protruding part covered by a posterior pharyngeal diverticule lacking pharyngeal folds. Thus we have here splendid agreement with *Cr. wahlbergi* from South Africa.

Kaburakia excelsa n. g. n. sp.

(Plate III, Figs. 7—10. Plate IV, Figs. 23 and 29.)

Locality: False Narrows, Nanaimo, Vancouver.

Material: Three very large and three smaller specimens collected under stones at low-water June 29th, 1915, and preserved in formalin.

Habitus: The animals (Plate III, Figs. 8 and 10) have a

more or less rounded outline. In the hinder body-half the lateral lines converge more, while the anterior part of the body may present a half-circular outline. The extreme posterior end is broadly rounded. The body has its greatest breadth anterior to the mouth and is in the central area of great thickness. This gradually diminishes toward the margin where the body is leaflike thin. Owing to the contracted state of the body (formalin preservation used), the edge is always more or less folded. The consistency of the animals is remarkably tough.

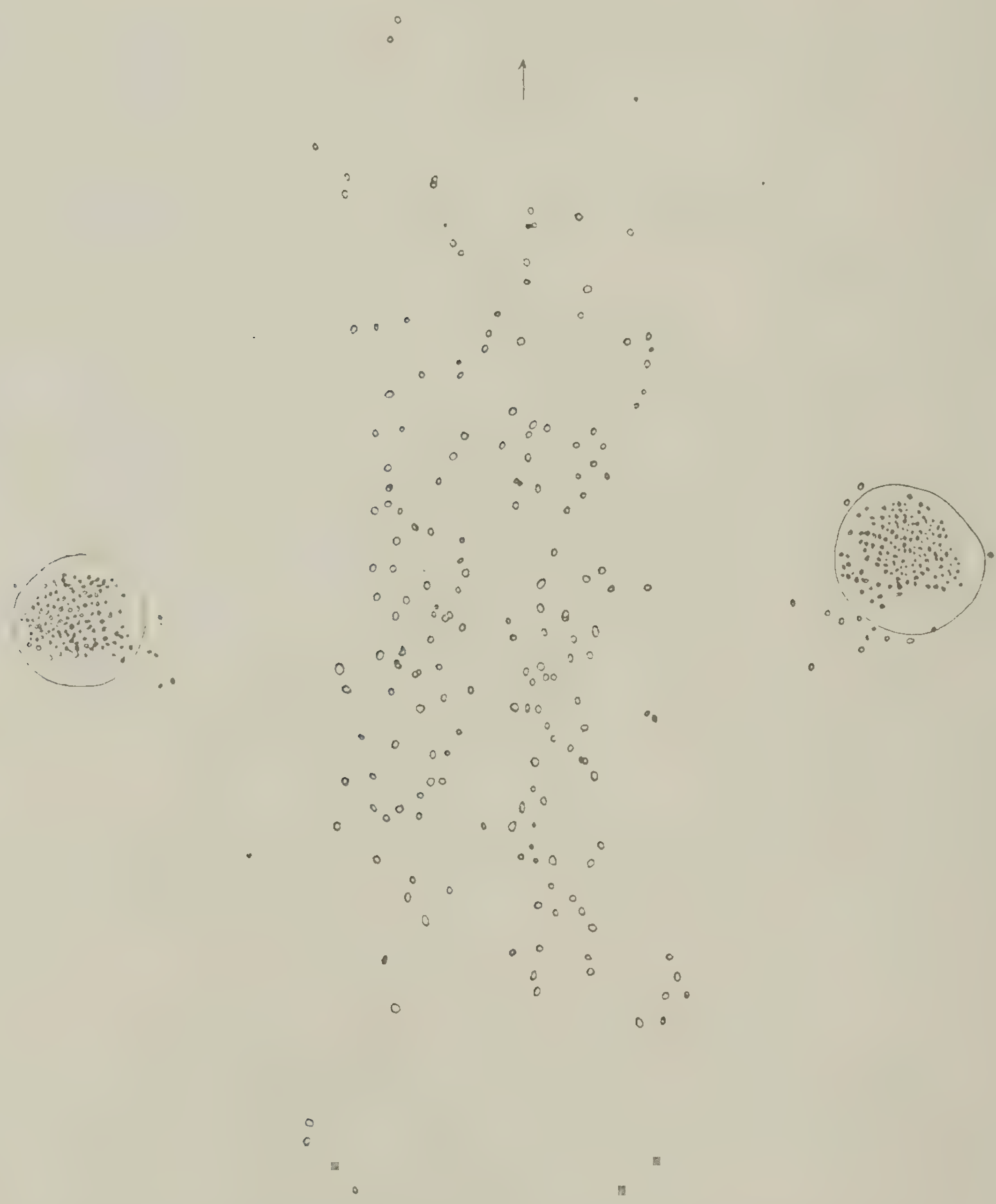
The tentacles show a very good development. They are large and evidently very contractile, and, which is of special interest, they are retracted into deep specially formed depressions. The furrow surrounding each tentacle is shown in text-figure 22. It is very deep. Thus it is only the tips of the tentacles that project above the edge of the furrow, giving the false impression on the reproduced photo (Plate III, Fig. 10) that the tentacles have a low, half-globular shape. In reality they are also in the preserved state rather long and stout (Plate IV, Fig. 23). There is no question but that these depressions are no casual formations, since they reoccur in all the specimens, but that they represent a special feature for the protection of the tentacles. When thus the tentacles are retracted by means of strong retractor fibres, a veritable sheath surrounding them is formed. The compact and thick basement membrane of the body becomes in the tentacles of decided thinness, which appears already at the outer border of the furrow-like depression (Plate IV, Fig. 23).

Colour: The upper surface of the body is nicely mottled or sprinkled with dots of a brownish tint. Their real colour is pure fuscous or rather fusco-ater but, as the patches are partly hidden by the overlying, thick, yellow-grey epidermis, the effect becomes dull when the epidermis is undamaged. The pigment patches of irregular and indistinct outline are smaller and more densely gathered in the middle area, especially above the pharynx, but more sprinkled towards the margin of the body (Plate III, Fig. 8). Above the brain the pigmentation is not remarkably poorer than in the surrounding area, or at least the difference is not very noticeable. The tentacles are, on the other hand, pigment-free.

The under surface of the animal (Plate III, Fig. 7) lacks, of

course, pigmentation, but receives a yellow-grey tint through the presence of gland cells in the epidermis.

Text-fig. 20. *Kaburakia excelsa* n. g. n. sp. Marginal eyes. a. At the anterior end. 24 x. b. at the extreme posterior end. 45 x.



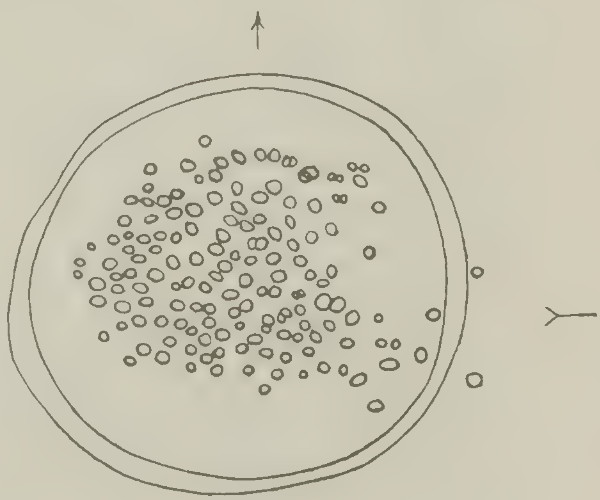
Text-fig. 21. *Kaburakia excelsa*. Cerebral and tentacular eyes. The circumference of the tentacles also drawn. 16 x.

Measurements: In the first place I shall give the measurements of the specimen the hinder part of which is cut in a series of

sections, as I regard this animal as the type-specimen. The figures in parentheses refer to the two largest specimens. The total length of body 41 (55; 56) mm., largest breadth $27^{1}/_{2}$ (35; 38) mm. The distance of tentacles from anterior margin 8.5 (12.5; 13) mm., their interdistance 3.8 (5; 5.3) mm. In transverse section the tentacle reaches 0.9 mm. The mouth is located at a distance of 24 (33; 33) mm. from frontal margin, the male aperture 5.5 (7.3; —) mm. from caudal end of body. The interspace between sexual openings is 1 (1) mm. The pharynx reaches a length of 20 mm.

Arrangement of eyes: There are marginal, cerebral, and tentacular eyes, but apparently no frontal ones. The marginal eyes (text-fig. 20) occur in an enormous number, especially in the anterior part of the body. At the frontal margin they are densely arranged in many irregular rows (text-fig. 20 a). The exterior border of this marginal band of eyes is distinct, but on the internal side the eyes are more scattered. Thus there is a marked difference in the distribution, the peripheral ocelli being far more numerous. The distance of the „eye-band“ from the edge of the body is less than half its breadth. The „band“ continues all around the body and even at the posterior end holds a fair number of more scattered eyes (text-fig. 20 b). From the figures given one may gather (observe the difference in magnification) that here the eyes come closer to the margin than in the anterior body-half.

The cerebral eyes (text-fig. 21) are rather widely scattered. They are arranged in two elongated clusters, each consisting of nearly 100 ocelli. There is a well-marked difference in size between the cerebral ocelli on the one hand and the marginal and tentacular on the other. A comparison between text-figures 20 and 21 will make this clear. Although not so well marked, there is a preponderance in the clusters to have more eyes located behind than in front of the line connecting the tentacles. The latter eyes lie more sparsely. The tentacular eyes (text-fig. 22) are chiefly gathered together in a compact group in the interior of the tentacles. Their total



Text-fig. 22. *Kaburakia excelsa.* Upper end of a tentacle and the furrow surrounding it. When the tentacle is retracted, a pocket-like depression is formed. 45 x.

number markedly surpasses the amount of ocelli in the cerebral clusters. A look at text-figure 22 will be sufficient to note this, although only a part of the tentacular eyes (= the upper ones) are drawn. I must emphasize this feature of *Kaburakia*, as in *Cryptophallus*, a genus also possessing a ductus vaginalis, there is only an insignificant number of tentacular ocelli compared with the cerebral eyes; i. e. far less than one tenth of the number of the latter. In *Cr. wahlbergi* there are about 10, in *Cr. sondaicus* 20 eyes in each tentacular group, while here a couple of hundreds are found. I may also add that in *Cryptophallus* by far the greatest number of cerebral ocelli is distributed anterior to the tentacular line.

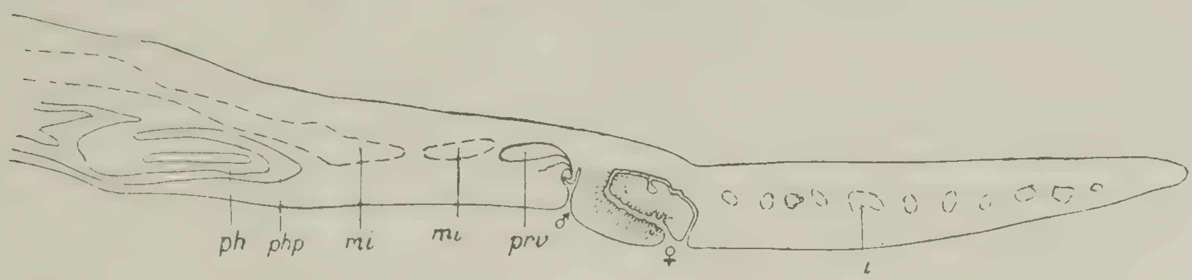
Text-fig. 23. *Kaburakia excelsa.* Arrangement of the pigment patches at the posterior end. 16 x.

In the epidermis the rhabdite cells are so extremely scarce that their presence can only be detected through a diligent search. On the other hand, gland cells with granular acidophil secretion abound in such manner that the whole epidermis seems to be stained red in eosin preparations. The most frequent gland cells contain a coarse-granular, deeply stainable secretion, others a fine-granular secretion, showing a paler tint. The former secretion is perhaps a substitute for the rhabdites. The latter reach 10 μ in length, while the dorsal epidermis is 80 μ thick.

The basement membrane is unusually thick, partly contributing as it does to the marked consistency of the body. It measures 20—30 μ and shows a lamellar structure. On account of the contraction of the powerful muscularis, it is laid in numerous small folds. The muscle wall of the body is very compact and its thickness in proportion to the epidermis is about twice that of *Cryptophallus*. The pigment patches, which give the upper surface of the body its characteristic pattern, are invested in the dorsal muscle layers; hardly any pigment is detectable in the parenchyma, while basement membrane and epidermis are absolutely free from pigmentation. In text-fig. 23 I have drawn the pigments patches at the posterior margin of the body to demonstrate their distribution and diminishing size. The figure refers to the type-specimen photographed on Plate III, Fig. 10.

The pharynx is excessively folded. One may obtain an idea about it from Plate III, Fig. 7, which shows the pharynx partly protruded through the mouth. The large pharyngeal pocket has very deep and broad side-pockets, some of them being two-lobed.

Male organization: The testes as well as the ovaries have the usual location. The male apparatus lies behind the pharyngeal pocket, not below as in *Cryptophallus*. Its distance to pharynx is



Text-fig. 24. *Kaburakia excelsa.* Sagittal section through the hinder part of the body, demonstrating the location of genital apparatus in relation to pharynx and the posterior margin of the body. 9 x.

nearly 2 mm., or more than twice the interdistance of the genital pores (text-fig. 24). There are two false seminal vesicles (text-fig. 25) developed in the hindermost part of the great seminal canals. They are parallel to the prostatic vesicle and lie along the sides of this at about a distance double their thickness. Their musculature is not very dense, and is about half the thickness of the ventral muscle wall of the body. The nuclei occur in and around the muscular envelope. Their stout efferent ducts run in transverse direction and open below the prostatic vesicle into the ductus ejaculatorius, provided with a moderately developed muscularis (text-fig. 26).

The prostatic vesicle reaches a length of somewhat more than $^{2}/_{3}$ mm. and has a club-like shape, with the swollen part at its proximal end. It does not take a vertical position as in *Cryptophallus*, but, as in most Stylochids, is directed backwards, nearly parallel with the body-wall. Forming a compact „fret-work" of interlacing fibres, its muscularis is traversed to a great extent by broad gatherings of exits for the extracapsular prostatic gland cells (Plate IV, Fig. 29). The interior of the vesicle is lined with a low, 8—12 μ, normal epithelium, the cells of which are filled with a dense-looking protoplasma. There is a thick layer between the darkstained (with hematoxylin) epithelium and the muscularis. As in the preparation the traversing exits of gland cells are empty, the

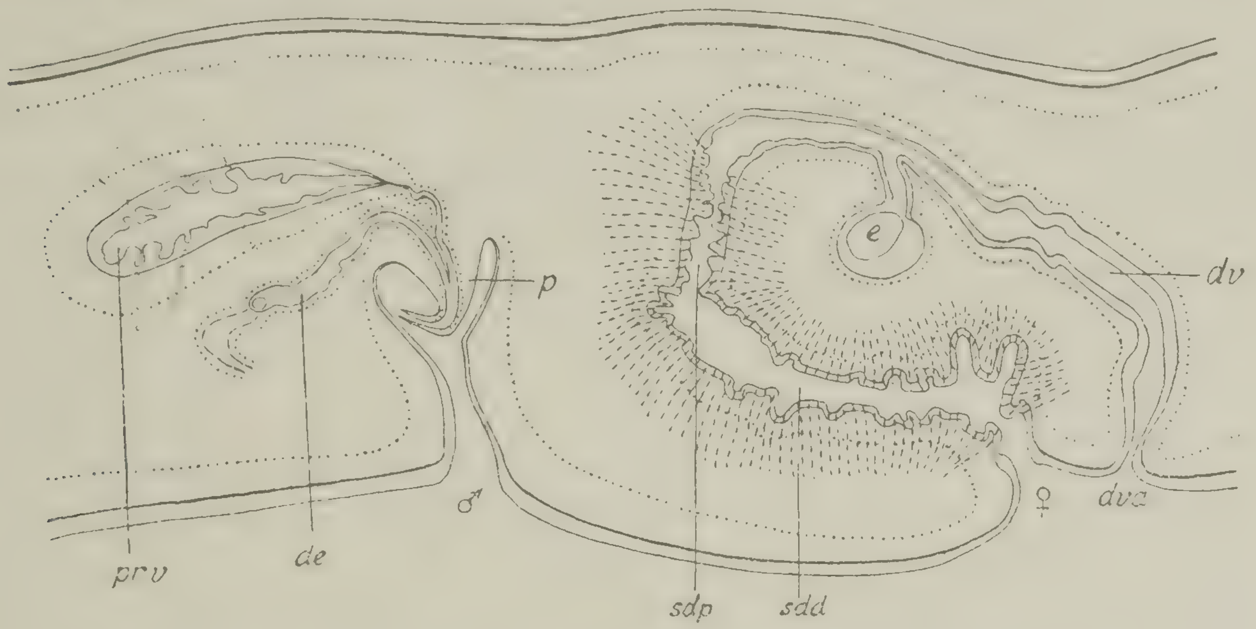
layer very much resembles a connective tissue. No bodies of gland cells have been observed inside the vesicle. The interior of the vesicle does not present such regular-looking chambers as are characteristic of the vesicula granulorum in *Stylochus*, but the interior wall (epithelium and underlying layer) projects in numerous folds of different size and direction (text-fig. 26). The vesicula granulorum is thus more complicated and far better developed than the strongly reduced prostatic vesicle of *Cryptophallus*. I shall further emphasize that the location of it is also quite another than in that genus, having the same orientation as that of *Stylochus*, *Idioplanoides*, etc. It remains to mention that the club-like shape of the organ is mainly caused by the gradual increase of the muscular envelope in anterior direction.

Text-fig. 25.
Kaburakia excelsa. Genital apparatus as it appears in ventral aspect on the animal mounted in cedarwood oil. 30 x. dva, ductus vaginalis with its opening to the exterior; e, egg on the way to vagina, having entered the median uterine canal; fvs, false seminal vesicle; prv, prostatic vesicle. The outline of the muscularis of the lower parts of the female apparatus is dotted, as is also the muscle envelope of the vesicula granulorum.

The ductus ejaculatorius joins the likewise sinuous efferent duct of the prostatic vesicle at the basal third of the penis. This organ is inserted in the upper part of the antrum masculinum and thus has a vertical position. In the animal sectioned the penis is casually bent anteriorwards near the apex (Plate IV, Fig. 29). The penis is unarmed, rather short, with the apical part narrow and tapering. Formed by outer finer circular and inner stouter longitudinal fibres in several rows, its muscularis is not thick. The antrum masculinum, of moderate size, has a strong muscular wall and a glandless ciliated epithelium. It may be mentioned that the antrum is partly filled with a mass of prostatic secretion intermingled wih sperma, and that sperma fills the penis canal as well as the ductus ejaculatorius (Plate IV, Fig. 29).

F e m a l e a p p a r a t u s: This is of considerable interest as we here meet with a ductus vaginalis. Such a duct is previously known in the family *Stylochidae* for the genus *Cryptophallus* (Bock 1913),

a second species of which is described in this paper, and for *Bergendalia* (Laidlaw 1903, Yeri and Kaburaki 1918). In the latter genus there is a well separated aperture for this duct behind the female gonopore, while in *Cryptophallus* the ductus vaginalis opens



Text-fig. 26. *Kaburakia excelsa.* Genital apparatus in sagittal section. 40 x. de, ductus ejaculatorius; dv, ductus vaginalis; dva, external opening of the ductus vaginalis; e, egg, just entering the median uterine canal; p, penis: prv, prostatic vesicle: sdd, sdp, distal and proximal part respectively of the shell duct (ootype). Outline of muscularis is dotted, shell glands indicated as short lines, and the presence of extra-capsular prostatic glands, the exits of which traverse the muscular envelope of the vesicula granulorum, is indicated through fine dots.

into the distal part of the vagina. Thus there is formed a small but distinct antrum femininum. Here again the ductus vaginalis presents a feature that deviates slightly from the conditions in *Bergendalia* and in *Cryptophallus.* On the one hand, it is not accurate to say that the ductus vaginalis opens into the vagina; on the other hand, the separation from the vaginal opening is not quite distinct. To speak of a second female pore does not fully explain the condition. In the median, sagittal sections the ductus vaginalis appears to open at the hinder border of the vaginal opening. It is perhaps too much to say that the two ducts open together in a pitlike depression, but anyhow it is not very far from the truth, as a look at text-fig. 26 will show.

The vagina (text-fig. 26) of the new genus is doubtlessly better developed than that of the genus *Stylochus*, but this is only valid for its most important part, the shell duct. Almost directly after the beginning the vagina bends forwards; the pars externa is extremely short, as the shell glands openings occur very close to

the external pore. The shell duct (= ootype) forms nearly the whole length of the vagina; the internal part, free from shell gland exits being also of insignificant length. The transformation takes place where the dorsal limb of the vagina bends downwards. There are numerous projections of the walls of the vagina. In the proximal part of the shell duct (text-fig. 26, sdp) there mainly exist projecting ridges formed solely by the epithelium, but in the broader, ventral limb of the vagina (sdd) the whole wall contributes to the wavelike appearance; thus the wall is regularly folded. In this latter part the vagina has its greatest calibre, then diminishes somewhat in diameter when it turns upwards, but it narrows at first to a considerable degree in the dorsal limb to form pars interna vaginae. The median uterine duct is short and is to a certain extent directed frontwards. From the place where this duct opens, a canal holding the same calibre continues backwards, like a duct of Lang's glandular vesicle, but later on it passes downwards. During its course the epithelial canal forms a small loop in a sideward direction. The opening of this ductus vaginalis (text-fig. 26, dva) to the exterior at the hinder border of the vaginal opening has already been discussed. During its entire course the ductus vaginalis holds a nearly uniform diameter with the pars interna vaginæ. Thus there is an apparent difference in respect to calibre between the external parts of the vagina and the ductus vaginalis, and this is especially noteworthy in the transverse direction of the body (text-fig. 25). The vaginal opening is large and broad, the porus ductus vaginalis rather narrow (text-fig. 25). The muscularis of the ductus vaginalis is thick and shows a dense grouping of the fibres. The latter condition is not valid for the shell duct. The epithelium is high and columnar, and the cilia are longer and coarser than in the shell duct. The ductus vaginalis does not show a beadlike appearance as in the case of *Trigonoporus cephalophthalmus* Lang.

In regard to the other female organization, I need only point out here that the uteri are simple, unbranched, sinuous canals extending forwards as far as the pharynx.

The new species approaches most closely the genus *Cryptophallus.* Both are provided with a ductus vaginalis as the most remarkable feature in the female organization. They further agree in possessing simple uterine canals. In regard to the male apparatus,

we meet with the same feature, the presence of false seminal vesicles. It may further be added that in both the penis lacks penis-sheath, is unarmed, and orientated vertically.

On the other hand, there is a considerable difference in the position of the male apparatus. *Cryptophallus* has the male apparatus below the pharyngeal pocket, and this is the only occurrence of such a feature among all Acotyleans. In spite of this location, the prostatic vesicle is vertically placed, which is possible only through the inconsiderable size of this organ which is more simply organized than in any other Stylochid. There is a well-marked distance from the male apparatus to the pharyngeal pocket in *Kaburakia*, and the prostatic vesicle has the normal horizontal orientation usually occurring in the family. Contrary to the condition in *Cryptophallus*, it is also provided with numerous folds in its interior. In the latter genus there is a greater distance between the two sexual pores, while in *Kaburakia* the male aperture is more approached to the vaginal opening. Unlike the genus *Stylochus* the sexual pores are not near the posterior margin of the body.

In the organization of the tentacles we have further dissimilarities. They are only „unbedeutende Hervorwölbungen" in *Cryptophallus* (Bock 1913, p. 120), while in *Kaburakia* they are not only large, in the living state probably fingerlike projections, but are also retractable into the body, a kind of tentacle-sheaths thus being formed.

Both genera agree in having a large number of eyes around the anterior part of the body. But in other respects the arrangement of eyes shows pronounced differences. Frontal eyes are scattered all over the anterior body-end in *Cryptophallus*, while in *Kaburakia* they are absent. In the former genus the cerebral eyes are densely grouped and very numerous and by far the greater number of them lies posterior to the line connecting the tentacles. On the other hand, the number of tentacular eyes in *Cryptophallus* is insignificant (10—20 in each cluster), while in *Kaburakia* there are a couple of hundreds in each tentacle.

As *Cryptophallus* already includes two doubtlessly closely related species, I think it necessary to give generic rank to this new species. Thus the generic name *Cryptophallus* will still express the singular location of the male apparatus occurring in its species.

The new name is given in honour of Dr. Kaburaki, who has enriched our knowledge of *Stylochidae* with a series of new forms. The genus *Cryptophallus* in known from Port Natal in West Africa and the Malayan Archipelago, while the new genus is a member of the temperate Pacific fauna of North America.

I may here add that the same species is represented by several specimens in my collections obtained in Puget Sound at Seattle, and courteously presented to me by Professor Trevor Kincaid, A. M., University of Washington, during my visit there.

The new genus I give the following diagnosis: Rounded or oval Stylochids with a large, very consistent, and thick body with thin edges. Tentacles long, retractable into sheaths. Marginal eyes around the whole body; no frontal eyes; cerebral eyes in two clusters; in the interior of tentacles and below them an extreme number of eyes. Mouth in the second third of the body. Pharynx, extremely folded, and very deep, sometimes bi-lobed pharyngeal side-pockets. Non-anastomosing intestinal coeca. Male and female pores rather close to each other, farther away from hinder margin of body. Male apparatus at well-marked distance behind the pharyngeal pocket, with false seminal vesicles, chambered, backwards directed vesicula granulorum, and unarmed, vertical penis without penis-sheath. Ductus vaginalis opening to the exterior at the border of female gonopore.

Enterogonia pigrans Haswell 1907, var. **novae-zealandiæ** n. var.

(Plate III, Fig. 17. Plate IV, Figs. 24, 31 and 32).

Locality: Ponui Island, Auckland, New Zealand. Underneath stones on the beach.

Material: Four specimens obtained December 24, 1914, and preserved in formalin.

In his important paper on Australian Polyclads, Professor Haswell (1907 b) has briefly described a Polyclad which very likely represents the same species as the present specimens. I will discuss the question of identification at length below. It may be mentioned here that at first I was in doubts as regards the locality

of Haswell's specimens as no comment occurred as to this. His paper concerns specimens collected in places as scattered as Sydney, Masthead Island, Cooktown, Tasmania and New Zealand. But in another treatise (Haswell 1907 a), I have found a note to the effect that the Polyclad in question was collected at Sydney. This fact, combined with the actual differences between his description and the features observed in my specimens, could raise some doubts about the justness of the identification. With regard to the considerable distance between the two localities of collection, it may already here be stated that this in itself does not forbid a presumption of identity. Yet, on the other hand, the possibility of vicariating forms or species is not excluded. Unfortunately the New Zealandian Polyclad fauna is too little known to allow conclusions from analogies to any great extent. Nevertheless we are aware that such a genus as *Notoplana*, with its great number of highly specialized species, is represented in both faunas with the same very characteristic species, *N. australiensis*. What is known as regards other groups of marine animals is at least no hindrance for an identification.

Turning now to a comparison between the specimens collected by Dr. Mortensen and Haswell's description, we find in many respects very striking resemblances. On the other hand, differences are also found. But these may be attributed either to actual variation in the species as to size, colouration, etc. or to the circumstance that certain features which are not easily detectable have been overlooked in the first description. For a closer comparison the value of figures cannot be overestimated, and I must deeply deplore the fact that the important collection treated by Haswell has not been so profusely illustrated as it certainly deserved. Thus only a single figure, a schematic diagram of a sagittal section of the genital apparatus, is given for his new genus *Enterogonia*.

Having no material of the Australian *Enterogonia pigrans* at my disposal, I cannot make the necessary revision or verification of Haswell's description and complete it with some desirable details. Thus at present it is impossible to decide with certainty the question as to the identity of the form from New Zealand with that from Australia. Under these circumstances I find it better to provisionally keep them apart than to make an identification which eventually

cannot be upheld in the future. In naming the former *E. pigrans* var. *novæ-zealandiæ* I shall indicate, on the one hand, that I assume that they belong to the same species and, on the other, that sufficient data for a veritable and full identification are lacking. To this latter cautious view Haswell's direct statement as to the antral glands has contributed more than anything else. I appreciate too much Haswell's valuable researches on Turbellaria to omit full regard to his descriptions. Before a satisfactory explanation as to this difference is obtained, I am prevented from making an identification.

The study of the specimens from New Zealand has given the following results.

First of all, with regard to the exterior appearance, Haswell's statement that *Enterogonia pigrans* has a thickish form of comparatively firm consistency, and has an oval or elliptical outline is also valid for the specimens from New Zealand. On the upper surface there are also a large number of dark minute spots and their smaller size and more scattered distribution towards the margin is also very apparent. The difference in colour of the spots, my specimens being more greenish brown, while the Australian form is dark olive, bears perhaps no weight at all, as in both cases the observations have been made on preserved specimens only. The measurements given by Haswell are 1 cm. in length and 5 or 6 mm. in breadth. The same proportions are held by my specimens, which, however, attain a far larger size, or from 26 to 34 mm. in length.

It is sufficient to point out here that corresponding differences are in many instances met with in sexually ripe individuals, undoubtedly belonging to the same species. As an excellent example hereof I can, for instance, refer to *Prostheceraeus vittatus* in Scandinavian waters.

I quote further: »The mouth is considerably behind the middle of the body, and, in the fixed specimen, the reproductive apertures are situated very close together, and are nearer to the posterior edge than to the mouth.“ For comparison with Haswell's statement I shall here reproduce a photograph (Plate III, Fig. 17), where the openings are clearly visible. The following is said in regard to the arrangement of the eyes: „There are numerous scattered minute eyes over the brain region, and between the latter and the anterior margin, as well as marginal eyes running all round the periphery.

The eyes over the brain region are quite irregularly distributed, and not in any way bilaterally grouped."

At this place I am giving the corresponding text-figures for one of my specimens (textfigs. 27 and 28), and shall add that frontal

Text-fig. 27. *Enterogonia pigrans* Haswell, var. *novæ-zealandiæ*. Marginal eyes. a, At the anterior border; b, at the level of the mouth. 40 x; c, at the extreme posterior end. 40 x.

eyes are scattered over the fore-end. The first observer has very likely failed to recognize the tentacular groups, as well as the very small prominences that actually represent rudiments of tentacles. As the latter are very insignificant and it is necessary to specially search for them, it would be an excusable fault. A mistake as to the nature of these prominences is excluded, as they are observed in the same place on all the specimens. A verification of the tentacular nature can be made on sections as the epithelium covering them almost lacks gland cells. In order to distinguish between tentacular and casual groups of ocelli, it is sufficient to state that true tentacular eyes are located nearer the dorsal epidermis than cerebral or frontal ocelli.

The location of these rudimentary tentacles is slightly in front

of the level of the brain (text-fig. 28, br). The number of the tentacular eyes is only about 10 in each group, which corresponds to the conditions met with in *Cryptophallus wahlbergi* Bock.

The cerebral eyes lie mostly behind a line, connecting the tent-

Text-fig. 28. *Enterogonia pigrans* var. *novæ-zealandiæ*. Arrangement of cerebral and tentacular eyes. 24 x. Outline of the tentacular rudiments drawn; br, indicates the location of the brain.

acular rudiments (text-fig. 28). The size of the ocelli is remarkably small. Haswell's description of *Enterogonia* ends with a short report on the male and female copulatory apparatus based on the diagram mentioned above. There is furthermore a discussion on the relationship of the genus in question and on the ductus genito-intestinalis. As to the anatomy of the genital apparatus, I shall reprint the few sentences given by Haswell, since his statement is accurate in a high degree also for my specimens. However, in a very important respect I am able to complete this description; that is,

concerning the prostatic organ. The original text, which may be compared with my text-figure 29 and 30 and Plate IV, Figs. 24 and 31 runs as follows:

„The male aperture leads into a nearly vertical antrum, the epithelium of which is thickened and raised into ridges. Here are situated the unicellular glands corresponding to the prostate glands. Into the antrum projects the penis in the form of a short muscular papilla entirely devoid of chitinous parts. The ejaculatory duct, formed by the union of the lateral vasa deferentia, is a sinuous tube which presents no appearance of becoming thickened or dilated to form a vesicula seminalis.

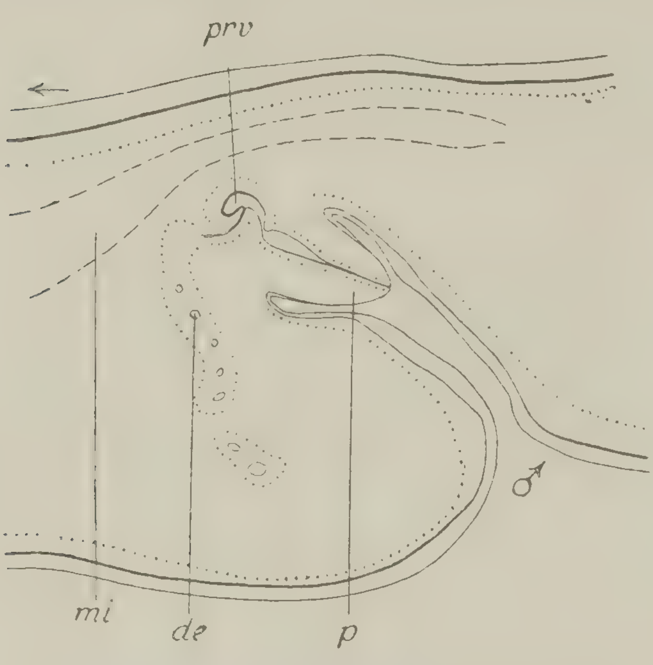
The antrum femininum is a vertical chamber with a fairly thick muscular wall. The ootype curves forwards and upwards from the antrum and bends sharply downwards and backwards to form the dorsal limb of the vagina. The ootype is characterized by the development of a peculiar spiral ridge of its epithelium. The dorsal limb of the vagina, after receiving on its ventral side the common duct formed by the union of the lateral uterine ducts, runs backwards as a narrowing tube, which opens behind into the median posterior branch of the intestine — a genito-intestinal passage being thus established.“

This description agrees, indeed, rather well with the conditions found in my material. But granular gland cells are not observed in the antral epithelium. „The median posterior branch of the intestine“ is the hinder part of the main gut. In my series of sections it has no bead-like appearance as the true coeca.

When I made my revision of the Acotylean Polyclads in 1913, I had of course to relie solely on Haswell's description, cited above. It was evident that the genus belonged to my new group *Craspedommata*. As to the ranking in family, the absence of a prostatic vesicle, the singular development of the female apparatus, no notices about tentacles or tentacular groups of eyes, of alimentary system, etc. brought serious difficulties. Anyhow, the proposed close relationship to *Discocelis* (*Thalamoplana* is by me included in that genus) seemed to me dubious, and I then placed *Enterogonia* together with *Microcelis* in the family *Cryptocelidae*. The presence of gland cells in the antral epithelium was regarded by Haswell as a substitute for a prostatic organ. But *Discocelis*, supposed to be allied, is

characterized by a large number of peculiar prostatic organs arranged in the wall of the penis and I found consequently no reason to regard the unicellular glands of the antral epithelium of *Enterogonia* as homologous formations.

The examination of the material of *Enterogonia* from New Zealand has now, however, given remarkable and unexpected proof that the genus without doubt belongs to the family *Stylochidae*. This is at present one of the best known families, and is very natural in the restriction I gave it in 1913. A closer study of the male apparatus of *Enterogonia* has revealed the fact that a prostatic vesicle is not absent. Its rudimentary nature together with the very sinuous course of the ductus ejaculatorius makes it very excusable to overlook it. Moreover, a superficial observation of the genital apparatus in my series of sections would give the impression that a prostatic vesicle is lacking, as with ordinary microscopic magnification it could easily be mistaken for one of the many loops of the ductus ejaculatorius, of which there are several transsections on the longitudinal sections through the male apparatus (Plate IV, Fig. 31).

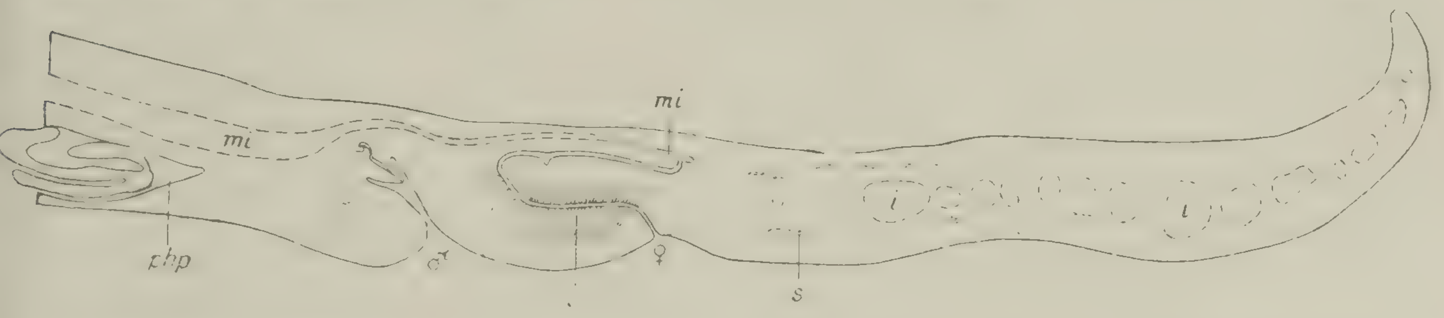


Text-fig. 29. *Enterogonia pigrans* var. *novæ-zealandiæ*. The male organ. 45 x. de, ductus ejaculatorus; mi, main intestine; p, penis; prv, prostatic vesicle.

In the last loop of ductus ejaculatorius (de), which lies above the penis, there is a coecal appendage projecting on its dorsal side. The muscularis of this little vesicle (text-fig. 29, prv) is somewhat stronger than that of the ductus ejaculatorius, and it shows the peculiar basket-work characteristic of the vesicula granulorum. Its epithelial lining, without folds, is much higher than that of the ductus and is provided with unusually long cilia. They are visible on the photograph reproduced (Plate IV, Fig. 31). Examined with an oil immersion lens, the epithelium shows a number of small goblets in its outer part, and the presence of small eosinophilous granulae there as well as among the cilia gives

evidence that the characteristic secretion of the prostatic glands is not absent in this rudimentary organ. Extra-capsular gland cells are reduced to the uttermost degree, and only a diligent search reveals them, as this secretion has a staining ability similar to that of muscular fibres.

The position and the structure of this coecal appendage eliminates the doubts that it really answers to a vesicula granulorum, although



Text-fig. 30. *Enterogonia pigrans* var. *novæ-zealandiæ*. Sagittal section of the posterior part of the body. 10 x. i, intestinal branch; mi, main intestine; php, pharyngeal pocket; s. shell glands.

it is more poorly developed than is the case in any other Stylochid.

It is evident that the prostatic vesicle of *Enterogonia* is a purely vestigial organ of no apparent functional significance. As can be concluded from what has been said, the true ductus ejaculatorius enters the prostatic vesicle in its distal part and the common duct thus formed then continues downwards forming an angle with the ductus ejaculatorius. After ingressing the basis of the penis, it traverses in a straight course this organ in its entire length.

In the antral epithelium provided with ridges there are no cells that could be mistaken for prostatic gland cells. The antrum is longer than in Haswell's diagram.

It remains to mention that in full agreement with Haswell's statement the two sinuous seminal canals do not form any false seminal vesicles.

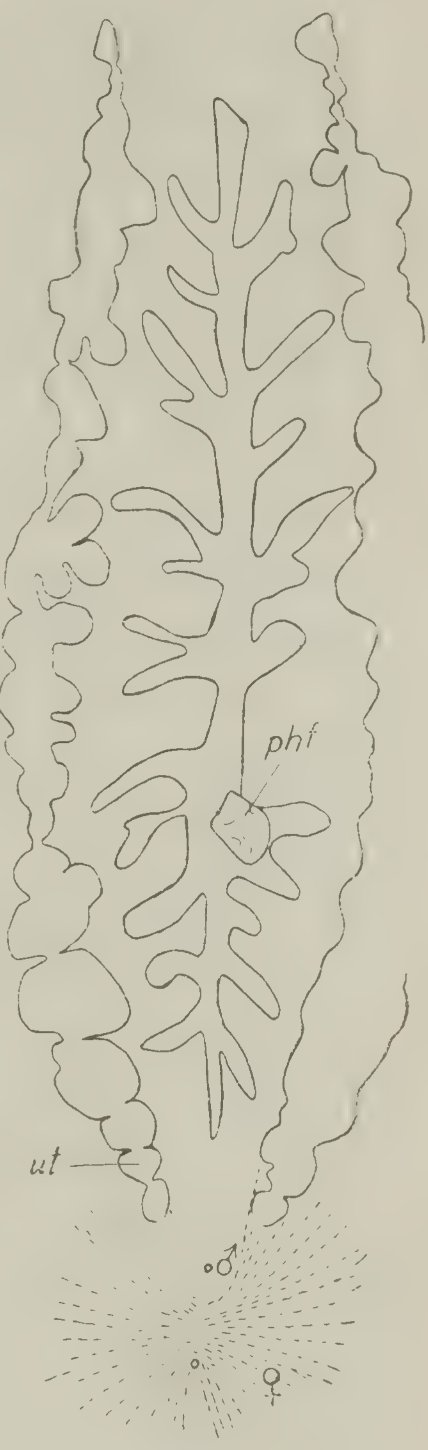
As regards the general appearance of the female apparatus, it is sufficient to refer to my text-figure 30 and the photograph (Plate IV, Fig. 24), as it agrees well with Haswell's account and schematic diagram (l. c., Pl. 37, Fig. 4). The spiral ridge in the proximal part of the shell duct (ootype) is also present, and only the epithelium is involved in its development, as indicated in the figure presented by Haswell and as I have above related regarding some other Stylochids. The ductus genito-intestinalis has a structure that

agrees well with that of pars interna vaginae. The muscularis has about the same thickness as the epithelium. Around the opening in the intestine the ductal epithelium continues as a short brim. In an easily recognizable and characteristic way the cells are filled with a dense protoplasma stainable with hematoxylin. The passage from the ductus to the intestine is open, and dilators are inserted at the place where the ductus reaches the intestine. The muscularis of the duct is here thinner and no special muscle-sphincter has been developed.

That the connection between the genital and intestinal systems is not without results my sections bear full evidence. However, in the main intestine (Plate IV, Figs 24 and 31) there is no contents, but far away in the branching intestinal coeca of the hinder part of the body there are whole eggs and eggs-fragments. These lie free in the lumen and some appear very little affected. But, in the lumen of another coecum there is also a half-digested mass which, to judge from the structural aspect and staining effects, must be derived from egg-material. The intestinal coeca show in most cases „hunger stages", as syncytia occur very infrequently. In some syncytial formations I have, however, observed a few globules of yolk-matter, indicating that the usual phagocytosal digestion also is represented in the sections. But usually the well-defined cells form a columnar epithelium. No evidence of sperma was found in my study of the intestinal system. This is hardly to be expected, however, as the uteri, though quite filled with ova, also seem to be entirely free from spermatozoa.

The investigation shows that in *Enterogonia* the specimen's own eggs may casually play a rôle in the nourishment of the animal. This modus can hardly fill the needs of the animal to any great extent, when one considers the large dimensions and the extensiveness of the digestive system. But, when no copulation has taken place, as is obvious in this case, it is undoubtedly an economical method not to waste the unfertilized eggs, but to transfer them to the alimentary system, using them for the metabolic processes of the body and the production of fresh eggs in supplying the ovaries with the assimilates. The ductus g. i. is consequently, according to my view, an adaptment solely for taking care of superfluous material in the genital system trough a transmission to the intestine.

A few words are needed as to the other organization of this Polyclad, as nothing is hitherto known regarding it. Generally speaking it shows an agreement with structures occurring in the Stylochids. The epidermis has, especially on the dorsal side, a very large amount of large-granular eosinophil gland cells, the rhabdites being scarce in agreement with several Stylochid genera. The muscular wall of the body is built up of coarse, densely gathered fibres. In regard to the layers, one notices that the ventral inner longitudinal layer has a rather weak appearance. On the dorsal side the muscularis never attains the thickness of the epithelium. Being in marked degree superficially located, the pigment patches are chiefly limited to the muscle layers. They never occur in or outside the basement membrane. This membrane has a homogeneous, gelatinous-looking structure. The outer and greater part of it is in hematoxylin-eosin preparations stained a light blue, while the interior part becomes strongly imbibed with eosin. The dorso-ventral system of fibres is extremely richly developed, but the fibres are never coarse. The mouth is situated posterior to the beginning of the third part of the pharyngeal pocket (text-fig. 31), and the pharynx is richly folded as is usual in a Stylochid. The pharyngeal pocket is in itself not a broad tube but is provided with deep side-pockets. This condition is at least to some degree visible on the photograph of the animal (Plate III, Fig. 17). This is also the case as regards the uteri, which extend as sinuous, unbranched canals somewhat more anteriorwards than the pharynx. The collections of eggs in them make them conspicuous (Text-fig. 31). The main intestine is not narrow above the pharynx, and has scarcely any Minot's gland cells on its ventral, though numerous ones on its



Text-fig. 31.
Enterogonia pigrans var. *novæ-zealandiæ.* The median region of specimen in cedar-wood oil as it appears in ventral aspect. Pharyngeal chamber, fold of pharynx (phf) protruding through the mouth, shell glands (as short lines), sexual pores and the uteri filled with eggs.

other sides (Plate IV, Fig. 32). Beadlike and stout, the intestinal coeca only branch and have no ventral pouches as in *Cryptophallus*. The testes and ovaries have the usual position.

It might further be mentioned that the female opening lies at the beginning of the sixth part of the body, or $5^1/_2$ mm. from the posterior margin at a body-length af 34 mm. The interspace between the sexual pores is $1^1/_2$ mm., and the distance between the male aperture and the pharyngeal pocket is only a little more than the distance from the former to the female pore (text-fig. 30).

It remains to consider the systematic position of the genus *Enterogonia*. As already mentioned, its ranking in the *Stylochidae* cannot be doubted. The distribution of eyes, the presence of tentacles — even if only of a rudimentary nature —, the rich folding of the pharynx, the deep pharyngeal side-pockets, the intestinal system, the structure of the body-wall, the location of the pigmentation, the consistency of the animal, etc. — all harmonize in a decided way with conditions already found characteristic of the Stylochids; nor do the features of the genital organs forbid the transferring of the genus into this family. The confirmation of its relationship to the Stylochids has just been shown and firmly established through the study of the male apparatus. It is certainly true that most Stylochids have a large, highly developed, and in a pronounced way specialized vesicula granulorum, provided as it often is with radial chambers in its interior. But representatives of this family are also known that have such a prostatic vesicle of a simple structure and of a pronounced small size. These genera, *Cryptophallus* and *Parastylochus*, show at the same time a dislocation of the vesicle into a vertical position just above or in the penis. Otherwise the vesicula granulorum lies horizontally, always above the seminal vesicle. This characteristic dorsal location of the prostate is retained in *Enterogonia*. Nor does the rudimentary nature of this organ conceal that it doubtlessly belongs to the Stylochid-type, as its proximal part is free. That the prostatic vesicle must be separate is a „conditio sine qua non“ for a Stylochid. Unparalleled in the family is, on the other hand, the fact that there are no seminal vesicles. This condition must originally have been primitive in the Polyclads. In *Ilyplana*, described above, we meet

with a nearly similar feature. The development of false seminal vesicles of *Cryptophallus* and *Parastylochus* forms a substitute for the missing unpaired true seminal vesicle. In the place of this latter we have, anyhow, the ejaculatory duct. In regard to the matter under consideration the new genus *Leptostylochus* forms an interesting intermediate link between the *Cryptophallus-*, *Parastylochus-*, *Discostylochus*-type and the *Enterogonia*. There the acquisition of a special musculature for a part of the seminal canals has not progressed further than to show a local strengthening. Furthermore, in *Kaburakia*, also described here, we meet the last type in the chain; that is, neither true nor false seminal vesicle in strict sense, but a combination of the two. Thus the discussion has given evidence that nothing in the male apparatus argues against the joining of the genus to *Stylochidae*, while at the same time the presence of the prostatic vesicle is full proof that my assertion is correct.

Leaving the ductus genito-intestinalis out of consideration, there is in the female organization no hindrance for the classification of the genus with the Stylochids. It might be mentioned that such a feature as the spiral epithelial ridge of the shell duct is also met with in some of the Stylochid genera, as discussed above.

Since we thus have been able to rank *Enterogonia* in *Stylochidæ*, it is of considerable interest that also the ductus genito-intestinalis is previously known in the family, being present in *Discostylochus parcus* from Hawaii, described in the second chapter my paper: Planarians I—III of this series. In both cases the duct is the very same kind of formation; i. e. a ductus vagino-intestinalis.

The question could then arise if we are entitled to unite the two genera, *Enterogonia* and *Discostylochus*. On account of the pronounced dissimilarity of the prostatic vesicle and also the occurrence of well-differentiated false vesiculæ seminales in the latter genus as well as some other differences, I must consider it necessary to maintain the two genera as separate. The divergencies of the male apparatus are, however, not of such an importance as to exclude the ranking of them fairly near each other. The formation of vesiculæ seminales and the progressive and regressive evolution respectively of the prostatic vesicle in the *Stylochidæ* are sufficiently discussed below to bring evidence also for the present case that

there is merely the question of an alteration of the very same original type. The differences are thus of no fundamental nature, which is an imperative necessity for the genera of the same family.

Returning to the ductus g. i., it could be pointed out that, in the present case, its rôle for the transfer of a surplus of sperma seems less important. *Enterogonia* has acquired no special reservoirs for the accumulation of sperma in a larger mass. Thus we can hardly expect that the female apparatus at the same copulation act receives an excessive amount of sperma. In full accordance with this view we find the ductus vagino-intestinalis short and narrow. The absence of any special adaptation for the reception of injected sperma harmonizes thus very well with the simplicity of the male organization. In *Discostylochus*, where the ductus vagino-intestinalis has a far better development (compare chapter II of „Planarians I—III" of this series) we meet with a highly specialized male organization, showing both a pair of large seminal vesicles and a prostatic vesicle of a considerable dimension.

There is in *Enterogonia* perhaps mainly a utilization of superfluous material coming from the uteri. For the transmittance of it to the intestine the ductus g. i. might as well have a very simple structure. My observations of eggs in the alimentary system, as related above, indicates that the duct has such a function.

The arrangement of the eyes within the family Stylochidae.

The eyes and their arrangement in *Stylochidae* deserve a special discussion. It is important that the attention is focussed on them to a greater extent than has formerly been the case. On account of the abundance of the ocelli, as well as their small size, most descriptions lack exact diagrams of the distribution of the eyes. Unfortunately there is frequently only a small paragraph in the text or else indications on the small-scale reproduction of the entire animal. Obviously such brief treatment is unsatisfactory and cannot be much useful in systematic studies. In this connection it should also be mentioned that an ordinary lens-magnification is not sufficient, but that a microscopic examination of well-preserved specimens is necessary, in order to discover the often minute marginal ocelli. The marginal eyes located further back in the body are particularly difficult to discern, because they are frequently extremely small,

possess very little pigmentation, and may in addition be very scattered.

For this reason, one must feel a little doubtful towards the assertion that *Stylochus nebulosus* Girard lacks marginal eyes when mature, while, on the other hand, the young specimens possess such. Meixner uses this argument in his treatise, when he considers the arrangement of the eyes in the genus *Stylochus* a systematic characteristic of not very great importance (1907, p. 115), basing his statement on Verrill's contention.

The individual fluctuation in the number of the eyes hampers to a certain extent their use in the systematic classification of species. The fact that the number of the eyes increases with the growth of the animal is well-known. This is especially noticeable in species with numerous eyes. Moreover, as a difference in number is found on the left and the right sides of the same specimen, one is at first rather indisposed to the practical use of this characteristic. A careful examination discloses the fact, however, that the fluctuation concerns more the number of the ocelli than their location and grouping. Moreover, examining a larger amount of specimens, one finds that, on the whole, the arrangement of the ocelli in both halves of the body corresponds fairly well. This applies not only to the size, but also, which is of more interest, to the direction of the openings of the eye-cups. The significance of the latter condition for the localization of the animal's movements can hardly be misconceived. In this connection I might mention that some of the cerebral eyes are located at a lower level in the body and approach the ventral muscle wall. The dissimilarity in the number of the eyes of the two halves of the body, when this is the case, may, at least partly, be due to the fact that one large eye on the one side corresponds to the two smaller ones on the other; i. e. that a division of the corresponding eye has occurred. This fact is more easily established in Polyclads where the number of eyes is small. Certainly other irregularities may occur than those which can be interpreted as caused by unequal contraction of the tissue. The more the number of ocelli increases, the more they tend to show a deviation from the symmetrical distribution. I suppose that this can be attributed to the circumstance that the groups of eyes rather than the individual ones are concerned as regards the movements of the animal.

In generalizing from a sparse number of specimens or a single individual, one must, of course, be cautious in regard to this character as well as to others. Preferably the comparisons should be made between full-grown, sexually mature specimens. An agreement in every detail is scarcely to be expected, as a certain individual variation is present also here.

With these reservations, I consider the arrangement of the eyes very usable for systematic purposes. I may here especially refer to the numerous species of the genus *Prosthiostomum* as good examples hereof. They demonstrate in an excellent way the value of this character for classification. And there the use of it has been generally accepted because the genital apparatus, male as female, presents a great conformity.

Returning to the special conditions existing in *Stylochidae*, we find in this family so rich in species the following groupings of the eyes: 1) marginal eyes, 2) tentacular eyes, 3) cerebral eyes, and 4) frontal eyes. The discrimination of the last group is not as authoritative as in the case of the other three.

Marginal eyes. These vary greatly within the family, both as to number and distribution. They occur along the entire margin of the body and in a particularly large number in *Kaburakia*, *Enterogonia*, *Cryptophallus*, and *Parastylochus*. In the genus *Stylochus* with its numerous species, several of these possess marginal eyes also along the entire margin of the body. They are more numerous and in several rows along the anterior margin of the body, but gradually diminish in number towards the posterior end of the body.

This is, for instance, the case in *Stylochus orientalis* Bock, *arenosus* Willey, *zebra* Verrill, *plessisi* Lang, *tauricus* Jacubowa, *hyalinus* Bock, and *marmoreus* Bock. They are also found along the entire body-margin in *Idioplanoides* and *Limnostylochus borneensis* Stummer-Traunfels and *annandalei* Kaburaki. In the following species of *Stylochus* they do not reach the posterior end but cease at distances different according to the various species: *cinereus* Willey, *ceylanicus* Laidlaw, *bermudensis* Verrill, *frontalis* Verrill, *nebulosus* Verrill*), *rutilus* Yeri & Kaburaki, *ijimai* Yeri & Kaburaki,

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*) Verrill (1893) states that young specimens of *Stylochus nebulosus* possess eyes along the posterior margin, while in older ones they are lacking there. Such a statement calls for a renewed investigation, as generally the

and *pusillus* Bock. *Limnostylochus amarus* Kaburaki also belongs to this category. The marginal eyes have a still smaller extent in the case of *Stylochus djiboutiensis* Meixner, *salmoneus* Meixner, *reticulatus* Meixner, *neapolitanus* Chiaje, *zanzibaricus* Laidlaw, and *pilidium* Goette; in these cases they reach the level of the tentacles. *Meixneria furva* Bock and *Idioplana australiensis* Woodworth have marginal eyes only in the first quarter and *Leptostylochus* in the anterior half of the body. In *Neostylochus fulvopunctatus* Yeri & Kaburaki they occur within a short distance back of the tentacular region, while *N. pacificus* Bock has numerous eyes at least still at the level of the genital pores.

Tentacular eye-groups occur in all the genera that I referred to the family *Stylochidae* in 1913. Regarding the remarkable and aberrant genus *Bergendalia*, see below. The genus *Stylochus* has large, partly retractile tentacles. The eyes are clustered at their base and may also occur in the interior of the tentacles. Moreover, definite tentacles are found in *Idioplana* (with ocelli on the anterior side of the tentacles), in *Idioplanoides* (in *I. atlanticum* Bock, with eyes both at the base and within the tentacles) and in *Kaburakia*. *Meixneria*, *Cryptophallus*, and *Parastylochus* have small tentacular protuberances with eyes situated underneath (Bock 1913). The same holds true for *Discostylochus*, *Enterogonia*, *Leptostylochus*, and *Ilyplana*. In *Neostylochus*, both in the case of *N. pacificus* Bock and *N. fulvopunctatus* Yeri & Kaburaki, I have pointed out small tentacular protuberances (Bock 1923, pp. 342 & 346) with underlying tentacular ocelli which are located more superficially; i e. closer to the dorsal epidermis. In *Limnostylochus*, Stummer-Traunfels has observed in the case of *borneensis* and Kaburaki in *annandalei* and *amarus* tentacular eye-groups. But at the same time Kaburaki states directly that tentacles are totally absent. Nor does Stummer-

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number of eyes increases with age. As mentioned above, Meixner (1907, p. 115) has emphasized this Verrills's communication when taking his stand against the arrangement of the eyes as a character to be used for a subdivision of the genus *Stylochus*. There is no question about the fact that Verrrill too much overlooked the systematic value of such a characteristic as marginal eyes. Consequently he was so completely misled that he has ranked this typical *Stylochus*-species in the genus *Planocera*. He actually defined (1893, p. 474) *nebulosus* „as a Planocera with marginal eyes“.

Traunfels (1902) mention tentacles in his *L. borneensis*. In spite of this it does not seem improbable to me that traces of rudimentary tentacles may be found in this genus, at least in the form of rudiments, marked by a glandless epidermis above the tentacular eye-groups. To clearly demonstrate such a condition it is necessary to examine sections through the body-region in question. Since this has not been made, I must regard the case as unsettled.

Cerebral eyes. In the genus *Stylochus* there are usually two elongated groups of eyes in the region of the brain. Most frequently they are well separated from each other (for instance, *S. djiboutiensis* Meixner, *pusillus* Bock, *ijimai* Yeri & Kaburaki), but may be fused posteriorly (for instance, *S. arenosus* Willey, *cinereus* Willey, and *zebra* (Verrill). In *S. orientalis* var. *splendida* Bock and *S. rutilus* Yeri & Kaburaki they have blended into one group. The cerebral eyes usually occur in a large quantity. They are few in *S. plessisi* Lang, *vesiculatus* Jacubowa, *tauricus* Jacubowa, and particularly so in *pusillus* Bock.

In a few cases further particulars as to the cerebral groups of the eyes in unmistakeable *Stylochus*-species do not exist. In regard to *S. zanzibaricus*, Laidlaw (1903) positively states that he has not found „any definite group of brain-eyes". A total absence of these eyes seems very improbable to me, until further investigations are made; the ocelli indicated back of the tentacles on Laidlaw's text-fig. 5 (1. c.) possibly represent cerebral eyes.

Two more or less distinctly separated cerebral eye-clusters are also found in *Meixneria*, *Parastylochus*, *Idioplanoides atlanticum* (Bock 1913), *Limnostylochus borneensis* (Stummer-Traunfels 1902), and *amarus* (Kaburaki 1918), as well as in *Ilyplana*, *Leptostylochus*, and *Kaburakia*.

In *Cryptophallus wahlbergi* Bock 1913 and *Idioplana australiensis* Woodworth 1898, the brain- eyes fuse into one single group. Laidlaw (1904, p. 128) likewise mentions only scattered cerebral eyes in the case of *Idioplanoides insignis*, and the same condition exists in *Limnostylochus annandalei* (Kaburaki 1918).

Frontal eyes. The group designated frontal eyes includes those few or numerous scattered ocelli located at the anterior end of the body that can neither be considered members of the marginal, cerebral, nor tentacular eye-groups. They connect the cerebral eye-clusters

with the rows of marginal eyes along the anterior edge of the body. Such ocelli have been pointed out in *Stylochus arenosus* and *cinereus* (Jacubowa 1906), *frontalis*, *nebulosus*, and *zebra* (Verrill 1893), *reticulatus* (Meixner 1907), *vigilax* (Laidlaw), *orientalis* and *pusillus* (Bock). They are only detached or else form the forward continuation of the cerebral eye-clusters (for instance, in *reticulatus* Meixner), or else they are very numerous and scattered over the anterior end (in *frontalis* Verrill). Frontal eyes are, moreover, found in *Meixneria* (detached), *Enterogonia* and *Cryptophallus* (numerous), *Parastylochus* (abundant), *Discostylochus*, and in *Limnostylochus*.

Frontal eyes are absent in some *Stylochus*-species (*djiboutiensis* Meixner, *salmoneus* Meixner, *neapolitanus* (Chiaje), *pilidium* (Goette), *plessisi* Lang, *hyalinus* Bock, *vesiculatus* Jakubowa, and *tauricus* Jacubowa); nor are they found in the genera *Idioplana*, *Idioplanoides*, *Ilyplana*, and *Leptostylochus*.

In the genus *Neostylochus* we meet more peculiar conditions in regard to the distribution of the eyes. In this case it is no longer possible to separate cerebral, frontal, and marginal eyes from each other, for the entire anterior end is diffusely covered with numerous small ocelli. This is particularly true in *N. pacificus* Bock and a *Neostylochus*-species that I collected in Misaki, Japan. Judging form the text-figure given by Yeri and Kaburaki (1920), the above condition does not seem to be so marked in *N. fulvopunctatus*. Here the areas on the outer side of the tentacles lack ocelli, while in the *Neostylochus*-species mentioned earlier the whole anterior end, even far back of the tentacle region, is dotted with eyes of homogeneous size and, peculiarly enough, without denser clusterings above the brain. In this scattered mass of ocelli the two small tentacular eye-groups, consisting of a few, 5—8, large ocelli located closer to the surface underneath the slight tentacular protuberances, which are characterized by a glandless epithelium, are distinguishable. Rows of marginal eyes continue along the sides of the body.

Discostylochus may be said to hold a middle position as to the distribution of the eyes, with *Cryptophallus* and *Parastylochus* on the one side, and *Neostylochus* on the other. The entire anterior end of *Discostylochus* has a large number of scattered ocelli and the cerebral eye-clusters are hardly differentiated. The poorly developed tentacles show likewise a close similarity to the genera

mentioned. *Enterogonia* approaches the conditions met with in *Discostylochus*. One would hardly place these genera very close to *Neostylochus* on account of the dissimilarity in their copulatory organs, but a comparison shows, however, that within the family *Stylochidae* there are represented many different stages in the distribution of the eyes, which could easily be arranged into an excellent series, where the two extremities would be, on the one hand, *Neostylochus pacificus*, and on the other *Idioplana*, as well as a number of *Stylochus*-species without frontal eyes. When one notices how very small, even-sized, and scarcely differentiated the ocelli, dotting the entire anterior end of *Neostylochus pacificus*, are, one is apt to assume that this is the more primitive organization. However, the presence of tentacular eyes in *Neostylochus* contradicts the idea that the arrangement of the eyes in its entirety might be primitive. The small tentacular protuberances with specially differentiated epithelium and with underlying larger ocelli indicate the inheritance from ancestors with better developed tentacles. Under such circumstances one should perhaps for the present assume a critical attitude toward the interpretation of the diffusion of ocelli over the anterior end and the absence of distinct cerebral eye-groups as a primitive feature. One is, moreover, entitled to this attitude, as the arrangement of the eyes in *Neostylochus fulvopunctatus* shows likeness to that of certain *Stylochus*-species and may have been derived from common ancestors. Such a derivation seems further plausible because of the presence of distinct tentacular eye-groups with their better developed ocelli in the case of *Neostylochus pacificus*, and because all the genera that so far belong to the family *Stylochidae* possess superficial tentacular eye-groups.

The genus *Bergendalia*, which I brought close to the family *Stylochidae* already in 1913, differs from the genera of this family in that tentacles are absent and in the diffusion of the ocelli over the entire anterior end of the animal, even far back behind the brain. The description that Yeri and Kaburaki (1918) give of *B. diversa* does not remove these last obstacles for the classification of the genus with the family *Stylochidae*. However, I cannot omit pointing out again that only a thorough examination of a series of sections of the anterior end can definitely ascertain whether or not any traces of tentacle rudiments or tentacular eye-groups are

present. A positive result of such an examination would set aside eventual doubt as to the justification of classifying *Bergendalia* with the family *Stylochidae*. One might say that, in regard to the arrangements of the eyes, the genus *Neostylochus* discussed above forms a bridge over to the genus *Bergendalia*. It can then be added that the tentacle rudiments present in *N. fulvopuntatus* Yeri & Kaburaki 1920 were so insignificant that they were not observed by the original describers (cf. Bock 1923, p. 346).

The absence of tentacles in *Limnostylochus* is discussed above, and here I shall only emphasize that the presence of tentacular groups of eyes in at least two species of it indicates that tentacles have once belonged to the organization.

I have here referred to and treated the tentacle question at length, because I believe that tentacles originally belong to the Stylochid-organization. But I am going also a step further. From the wide-spread occurrence of tentacular groups of eyes in *Craspedommata* and *Schematommata* must be concluded that this feature is very old and ancestral. The existence of two, well circumscribed groups of superficially located eyes at the sides of the brain ought to be interpreted as belonging to nuchal tentacles, the only kind of tentacles occurring in *Acotylea*.

To demonstrate how early the tentacular eyes and the tentacles really appear in the development, I might record the following case from my embryological researches. In young *Planocera reticulata* Stimpson just having reached the creeping stage, but with long larval appendages still remaining, the tentacles are already present, As they are well separated, it is already at a casual glance possible to distinguish without difficulty between the cerebral and tentacular eyes. Each cerebral cluster contains four more deeply located eyes, each tentacular group only two eyes, superficially and laterally situated. In older embryos still included in the egg-shells the same disposition of the eyes is seen, and consequently the tentacular eyes can be recognized even when the tentacular projections are not clearly defined in the sections of preserved embryos.

Lang has figured youngsters of Leptoplanids »aus dem Auftriebe“ (1884, Taf. 36), where cerebral and tentacular eyes can be distinguished at a rather early stage.

While marginal tentacles are confined to the Cotyleans, we find

nuchal tentacles or at least nuchal tentacular groups as a feature met with in the Acotyleans. The weight of the character is thereby indicated. *Stylochoides* is an exception to the rule, but in this Cotylean the finger-like and ocelli-provided tentacles, though removed from the margin, lie nearer to the margin than to the brain and consequently cannot be regarded as true nuchal tentacles. As can be expected from the other organization, margo-tentacular eyes are present. The Acotylean *Cestoplana* has a peculiar arrangement of the eyes (cf. Bock 1913, pp. 56—57) which deserves further investigation.

Seeing how general the occurrence of tentacular groups of eyes is in the Acotylea, one is consequently a little suspicious of exceptions recorded, and before accepting them, one will ask for a thorough examination of the case. It is of course possible that tentacular eyes and tentacles may disappear, and this is perhaps the case in *Bergendalia*. The lacking of eyes in *Plehnia arctica* seems to be such a feature of total loss of eyes, or at any rate loss of their pigment cups, demonstrating that reduction actually takes place.

Remarks on the male apparatus of the Stylochids.

The *Stylochidœ* present considerable interest, as they show a great variability with respect to several characters and at the same time rich possibilities of combination. Since the different organs in diverse stages of specialization or reduction are combined with each other, the result must be that the types of organization are highly multiplied and makes it necessary to distinguish a greater number of genera. Taking the organs separately, one finds it an easy task to arrange a sequent series of the types of each organ-development. We have, for instance, a nice series of intermediate links in respect to the prostatic vesicle (= vesicula granulorum), from the highly specialized state in *Stylochus* to nearly total disappearance of this organ in *Enterogonia*. The development of tentacles, pharynx, and alimentary system, seminal vesicles, penis, vagina, Lang's glandular vesicle, and uteri; the arrangement of eyes, the location of testes and ovaries, the position of genital pores, and so on, present a considerable variance.

But the series do not run parallel in the genera. The blending

together of organs of different degree of specialization is a characteristic feature of the *Stylochidæ*. It is apparent that this will hamper very much the efforts to bring the genera in a proper sequence in this family; this so much more the case as it is many a time difficult to decide whether a simple structure means a primitive condition or is the result of a regressive evolution. A simple organization in one respect is often combined with far advanced specialization in regard to some other organs. I have particularly laid stress upon the genital system and especially the copulatory organs when it comes to estimation of relationship and ranking of the genera. But the male and female organs do not follow each other in specialization. A rather striking case is presented by the genus *Stylochus*. The prostatic vesicle attains here its most complicated structure, while at the same time the female apparatus has the simplest structure in the whole family. However the development of body, tentacles, nervous system, and alimentary system, especially pharynx, has gone very far. The simplest type of male apparatus is met with in *Enterogonia*, but this condition is decidedly not primitive, at least as far as it concerns the prostatic vesicle.

If we then take the male copulatory organ as a subject for a comparative study, it is evident that none of the Stylochids yet described presents a real primitive type from which the other may have developed. According to the view which I accept, the original type for the male copulatory organ of *Stylochidœ* must have been a kind of glandular organ with muscular envelope, in possession of a free tip projecting into a pocket or antrum, which opened on the ventral side of the body behind the pharynx. This organ was the prototype of the prostate + penis + antrum. The seminal canals have later established connection with this glandular organ. At that time the penis was nothing but the very apex of this „prostatic“ organ. The separation of the prostatic vesicle from the penis, which in many cases has gone so far that it appears as an independent organ, stout and fleshy, or small and armed with a stylet, is thus a secondary feature. The pocket surrounding the tip of the glandular organ has been changed to an antrum masculinum. It was first small and formed originally by a simple invagination of the epidermis. The penis-sheath is a secondary

adaptation for the prolongation of the copulatory implement. Seminal vesicles represent a late acquirement for the accumulation and simultaneous ejaculation of a larger mass of sperma. In several Acotyleans they are not yet developed.

The interpretation that the seminiferous system has established connection with previously independent weapons of glandular nature which thus have been transformed into copulatory organs is not a new problem but for Polyclads has been vindicated by Lang (regarding *Anonymus*) and Bergendal. It is also in accordance with ideas developed by v. Graff. His starting point has been the *Acoela* and their poison weapon. However, I find it not necessary to accept his hypothesis of the *Acoela* as the ancestors of other Turbellaria and thus also of the *Polycladida*. As I shall describe in another paper, glandular weapons may also occur in the Polyclads fully independently of the genital system. Graff has treated the „muskulöse Drüsenorgane" of the Triclads in „Bronn" and enumerates a number of examples. With the exception of one, *Polycelis cornuta*,*) all these have them in atrium genitale. Several Polyclads, for instance *Paraplanocera discus* and *Boninia mirabilis*, have from one to many glandular organs in antrum masculinum. In this connection *Discocelis* might be recorded, though not enough appreciated by Lang, as having them of simple type.

After this short introduction, which was necessary in order to get an understanding of how the male copulatory organ has to be interpreted, we return to the Stylochids. If it is correct — and everything seems to speak for this theory — that the prostatic organ is the primitive element in the male apparatus of the Polyclads, it is at once clear that with respect to its male apparatus *Enterogonia* is a degenerated type, the vesicula granulorum appears here only as a little diverticle of the ductus ejaculatorius, a pitiable remnant from better days. A step further in the reduction of this diverticle would have brought about its complete disappearance and it would consequently have been nearly impossible to recognize and definitively prove that this male apparatus has originated from a Stylochidean type. I regard the successful interpretation of *Enterogonia* as one of the best results obtained from Dr.

*) This species deviates from *P. nigra* through having the organs in question in a special pocket shortly behind the genital pore.

Mortensen's, also in other respects, very valuable collection of Turbellarians.

Before leaving *Enterogonia*, I may point out that the prostatic vesicle has evidently been removed from the penis and obtained a horizontal location similar to that in *Stylochus*, before the reduction of it to a mere appendix of scarcely any functional value took place.

As I pointed out in 1913, *Meixneria*, collected by Dr. Mortensen in Siam, is a rather primitive Stylochid. The male apparatus has a prostatic vesicle situated close to the penis, and the latter being small, the condition conforms more closely to what I have above regarded as the original feature of the male apparatus than the case is in any other Stylochid except perhaps *Idioplana*. The penis is not very far from being only the apex of the vesicle. Provided only with a feeble muscularis, the narrow ductus ejaculatorius opens near the tip of the penis into the efferent part of the prostatic vesicle. The existence of false seminal vesicles, as well as a fold (= penis-sheath) projecting into the antrum, are secondary features. The prostatic vesicle, although very developed, has not reached the complication in the form of tubules met with in the genus *Stylochus*. The intracapsular glandular layer is thick and compact without separating septa, and has an undulating contour. On a close inspection it seems possible to distinguish between low epithelial cells and a heavy sub-epithelial layer filled up with granular secretion, as I have described for *Discostylochus*.

This differentiation inside the muscular envelope is absent in the prostatic vesicle of *Cryptophallus* and *Parastylochus*, where the epithelial gland cells are immediately surrounded by the muscularis. As the epithelium contains the gland cells, it reaches a fair thickness. The inconsiderable size of the vesicle in these two genera I regard as a regressive feature. The location of it in the penis could perhaps be regarded as primitive, but the stoutness of the penis and the reduction of the vesicle which has taken place allow no safe conclusion in this respect. That gland cells are included in the epithelium of the vesicle conforms also to a primitive condition. The weak and loose muscular envelope and the diminished number of extracapsular gland cells are features, agreeing with my view that a reduction has actually occurred. Only in these two

genera the vesicle attains a vertical position. Its reduced size in combination with its location in the interior of the penis near the apex may contribute to this unusual orientation.

Among the Stylochids provided with Lang's glandular vesicle we undoubtedly meet with the most primitive type in respect to the prostate in *Idioplana* and in yet undescribed forms allied to it. Woodworth's description gives hardly sufficient details, but the figure shows nevertheless the close relation to the penis, the original pearshape, and the primitive way in which the ductus ejaculatorius connects with the prostatic organ. A moderately thick (glandular?) epithelium covers its interior and is proximally slightly folded.

Most Stylochids have the prostatic vesicle removed from the penis, a more or less long efferent duct being formed. They agree mostly in having a horizontal position of the vesicle, with the proximal, blind end directed forwards. The shape approaches often an ellipse (in *Stylochus*-species) but when the structure is simpler, can be more elongated and narrow *(Neostylochus)* or even club-shaped *(Leptostylochus)*. The shape of the vesicle deviates most in *Limnostylochus*, as the organ appears here as a prolonged, sinuous tube.

The vesicula granulorum reaches undoubtedly its largest size and highest specialization in the genus *Stylochus*. The excessive folding up of the interior lining has given rise to a great number of radial tubes. On a sagittal section through the vesicle the lining appears corrugated and connective tissue projects into the folds as support. These latter septa would of course also show the tube-arrangement, if the glandular layer were removed. In the walls of the tubes or chambers a separation into two layers, as mentioned for *Discostylochus* and *Meixneria*, is recorded for many species, i. e. a non-glandular epithelium covering a heavy secretion-layer. An intermediate stage between the *Meixneria-Discostylochus*-type and the typical *Stylochus*-vesicle in respect to the structure of the vesicle is presented by *Kaburakia*.

Leptostylochus offers an altered type. The epithelium of the vesicle, carrying whole gland cells, conforms so far to the *Cryptophallus*-type. But it is also folded up in a way similar to that in *Stylochus*, thus giving rise to radial chambers. The connective tissue is, however, very sparse and contains no gland cells. It merely projects as thin lamellæ and forms a kind of skeleton of

honeycomb-like arrangement. In the honeycomb-cellulæ only the glandular epithelium forms the thick covering. It is evident that this type is simpler than the *Stylochus*-type.

As primitive condition I regard it, where the epithelium carries all of the intracapsular granular glands, as in *Crytophallus*, etc. The separation of an extremely low epithelium, having lost all the gland cell bodies and thus only pierced by their outlets and the formation of a subepithelial, intracapsular secretion layer, as in *Discostylochus* and *Stylochus*, must signify a specialization.

Thus, containing a very large amount of secretion, the subepithelial layer allows an increase of the capacity of the vesicle. We meet with this feature in the vesicles which have attained a considerable size.

A more simple type of vesicula granulorum than that of *Leptostylochus* characterizes some other members of the family. In the elongated, narrow vesicle of *Neostylochus*, the epithelium is unfolded and bounded by the muscularis. Having the singular shape of a sinuous tube, the exceedingly prolonged vesicle of *Limnostylochus* belongs probably to this kind of vesicles; at least there is nothing else suggested by the descriptions and figures. In passing it might be mentioned that, in agreement with *Neostylochus*, the fresh-water Polyclad *L. borneensis* possesses a penis stylet, while the tvo species described by Kaburaki (1918) have an unarmed penis. To the *Neostylochus*-type I count also the prostatic vesicles of *Bergendalia diversa*. I must here rely on a schematic diagram presented by Yeri and Kaburaki, since no details are given in the description. The horizontal position with the blind end directed forwards, the displacement away from the penis, and the oval shape agree with the type, and the low lining in the interior represents probably nothing but an epithelium. In *Bergendalia diversa* the prostatic vesicle has been much reduced. Situated above the penis it has a circular outline and connects with the penis canal by means of a long efferent duct. Laidlaw says that „its wall consists of a very thin layer of circular muscle-fibres, lined with a cubical epithelium“, having the appearance of an exhausted secretory tissue. The genus *Bergendalia* presents the interesting feature of a duplicate male organ situated before or behind the ordinary one, but lacking connection with the seminiferous system. Its prostatic vesicle shows similarity to that of the ordinary male organ.

Idioplanoides atlantica approaches *Neostylochus* with respect to the prostatic vesicle, but shows a slight folding in the proximal end of it. In *I. insignis* Laidlaw there are three *longitudinal* tubes developed in the anterior half of the vesicle (Meixner's revision 1907), thus presenting a transition to a more complicated state.

As related in the description above, a simplified prostatic vesicle is met with in *Ilyplana*. I regard this as a degenerated organ.

In *Stylochidæ* the prostatic vesicle seems always to be provided with extra-capsular glands. It is at least valid for those that I have observed in a mature state. Direct information is in some cases lacking, but I think the statement is nevertheless true. Meixner has not been able to find them in *Idioplanoides insignis* but both the histological state and the staining were unfavourable for their detection.

The removal of the granular gland cells from the epithelium to the parenchyma surrounding the muscular envelope of the vesicle has allowed both a far better supply of nutriment and sufficient space for increase in size and numbers. The acquirement of this organization goes probably very far back in the history of the Polyclads. I have met the feature in the independent „muskulöse Drüsenorgane“ and it is widely spread in the Polyclad families as a characteristic of the vesicula granulorum. Even the most reduced vesicles occurring in *Stylochidæ* have retained the extracapsular glands.

The treatment of the seminiferous system must be cut short. All the Stylochids possess the two large seminal canals and these lack always the commissure behind the female apparatus which is met with in *Leptoplanidæ*. The two canals unite to form an unpaired, median end duct, lying anterior to the penis. Provided with a thick muscularis it acts as an ejaculatory duct. Through local strengthening of the musculature at its proximal end a true seminal vesicle has been formed. As a compensation for this there appears in some other Stylochids (*Meixneria*, *Cryptophallus* etc.) through the same kind of process a so-called false seminal vesicle near the terminal end of each large seminal canal. A combination of the two features has given as result the three-lobed vesicula seminalis (*Neostylochus*, *Stylochus marmoreus* and others). In *Enterogonia* and *Ilyplana* vesiculæ seminales are absent as well as in a few other Acotyl-

eans, thus demonstrating a primitive condition. The prolongation of the ductus ejaculatorius in *Enterogonia* to a long sinuous tube, of value when the penis is protracted, I regard also as a substitute for the missing seminal vesicle.

The location of the ductus ejaculatorius is never irregular. This median duct runs always ventral to the prostatic vesicle, when the vesicle is horizontally or obliquely placed in a forward direction. By a vertical position of the prostate, as in *Cryptophallus* and *Parastylochus*, the duct is found anterior to the vesicle. It is evident that this position is in full correspondence to the former case.

The joining of the ductus ejaculatorius to the efferent duct of the prostatic vesicle takes place consequently on the anterior side of the latter. For the common duct, thus resulting, it may be of advantage to use a special name, penis canal. The length of it varies considerably, the extremes found in *Enterogonia* and *Parastylochus*. From a phylogenetical point of view, as also with regard to the actual condition, it is, of course, wrong to say, as some authors do, that the ejaculatory duct receives the duct from the prostatic vesicle, when just the opposite is the case.

A more primitive way of establishing connection with the prostatic vesicle is found in *Plehniidæ* and *Polyposthiidæ*. *Meixneria* and *Idioplana* show therein a certain resemblance to them, in full accordance with my view that these families are closely allied to *Stylochidæ*.

Key to the Stylochid genera.

A key of determination for the Stylochids was given in my paper of 1913, when I ranked them as a separate family. In 1920 Yeri and Kaburaki described a new genus, *Neostylochus*, and altered then the second part of the key. In treating a member of this genus I had the opportunity to correct some mistakes in that paper and consequently revised the key up to date. Although this was done so recently, there is, however, no question about the necessity to present a new key, since the knowledge of the Stylochids has been extremely increased through the studies of Dr. Mortensen's collections. In the previous year we counted only eight Stylochid genera, now there are not less than fourteen. The new members are, as already enumerated: *Enterogonia* Haswell 1907,

Discostylochus Bock 1925, *Ilyplana* n. g., *Leptostylochus* n. g., and *Kaburakia* n. g. Finally I have included in the family *Bergendalia* Laidlaw 1903, previously ranked as "Anhang" of the family (cf. Bock 1913, Yeri & Kaburaki 1918). The genus agrees in most respects with conditions met with in this family. The male apparatus shows a similar structure and the same general plan but for the fact that there is added a duplicate organ before or behind the ordinary one. The female apparatus belongs to the same type as occurs in the Stylochid-genera *Cryptophallus* and *Kaburakia*. The peculiar spiral ridge of the shell duct is also met with in some Stylochid-genera. As deviating features there thus remains to be mentioned the supposed absence of tentacular rudiments and tentacular groups of eyes. An examination of a series of sections through the anterior end of *Bergendalia*, evidently not yet undertaken, might perhaps verify my supposition as to slight traces of such formations. A similar task awaits, as indicated above, a careful and industrious investigator of *Limnostylochus*, where vestiges of tentacular rudiments have not as yet been observed.

To make the key more useful I have added a few characters other than those necessary for the establishment of the table. This undertaking will undoubtedly facilitate the recognition of the genera. I have also done it with the purpose of giving a short and convenient resumé of the family.

Key of determination.

I. Female apparatus consists only of an S-formed vagina which consequently does not emit a duct after receiving the uteri.

A. Genital pores widely separated. Vagina very long. *Prostatic vesicle large, horizontal, unchambered; false seminal vesicles; penis-sheath; tentacles half-globular; pharynx short.*

Meixneria Bock 1913.

B. Both genital pores near posterior margin of body. Vagina short.

a. Prostatic vesicle small, vertical, unchambered. Tentacles rudimentary. *False seminal vesicles; genital pores not very close to each other; pharynx very large.*

Parastylochus Bock 1913.

b. Prostatic vesicle very large, horizontal, chambered. Tentacles long. *True or trilobed vesicula seminalis; genital pores close to each other; pharynx very large.*

Stylochus Ehrbg. 1831.

c. Prostatic vesicle large, horizontal, unchambered. Tentacles rudimentary. Cyanophile antral glands. *No discrete seminal vesicles; genital pores close to each other: pharynx primitive.*

Ilyplana n. g.

II Vagina emits at its inner end a duct running in a caudal direction. Thus there is formed a median uterine canal.

A. The caudal duct opens into a Lang's glandular vesicle.

a. Lang's vesicle unpaired.

1. Penis unarmed.

α. Vagina of extreme length, stretching itself over and in front of the male apparatus. Tentacles long. *Prostatic vesicle moderately sized, horizontal, unchambered; trilobed vesicula seminalis; Lang's vesicle small; deep pharyngeal sidepockets.*

Idioplana Woodworth 1898.

β. Vagina short. Tentacles rudimentary. *Prostatic vesicle horizontal, unchambered; false seminal vesicles; Lang's vesicle large; insignificant pharyngeal sidepockets.*

Leptostylochus n. g.

2. Penis armed with a stylet. Tentacles rudimentary. *Prostatic vesicle horizontal, unchambered; vesicula seminalis.*

Neostylochus Yeri & Kaburaki 1920.

b. Lang's vesicle paired.

1. Prostatic vesicle large, horizontal, chambered. Long tentacles *Vesicula seminalis.*

Idioplanoides Barbour 1912
(= *Woodworthia* Laidlaw 1904).

2. Prostatic vesicle unchambered, ductlike, of considerable length. No tentacular prominences. *Vesicula seminalis; penis armed or unarmed.* In fresh or brackish waters.

Limnostylochus Bock 1913
(= *Shelfordia* Stummer-Traunfels 1902).

B. Caudal duct of vagina opens into alimentary system (ductus vagino-intestinalis).

a. Prostatic vesicle large, horizontal, unchambered. *Large false seminal vesicles; tentacles rudimentary.*

Discostylochus Bock 1925.

b. Prostatic vesicle only as a rudiment. *No seminal vesicles; tentacles rudimentary.*

Enterogonia Haswell 1907.

C. Caudal duct of vagina runs ventralwards as a ductus vaginalis.

a. Penis below pharyngeal pocket. Tentacles rudimentary. *Prostatic vesicle small, vertical, unchambered; false seminal vesicles.*

Cryptophallus Bock 1913.

b. Penis behind pharyngeal pocket. Tentacles stout and retractile into pockets. *Prostatic vesicle large, horizontal, chambered; false seminal vesicles.*

Kaburakia n. g.

c. A duplicate male copulatory organ. No tentacles. *Prostatic vesicle large, horizontal, ? chambered; vesicula seminalis ?*

Bergendalia Laidlaw 1903.

The geographical distribution of Stylochidae.

In his valuable monograph on the Stylochines Meixner gives in a table the distribution of 20 species, recognized as belonging to this group. He comes to the conclusion that the Stylochines "fast über die ganze Erde verbreitet sind". Although my family has a somewhat wider extension than Meixner's group, I must regard it as having a more limited distribution. The main divergence in our opinions refers in the first place to the fact that I exclude them from the Arctic and Antarctic Seas. The reason why Meixner took his standpoint was very soon afterwards eliminated. He expressed it thus: "Sogar im südlichen Polarmeer ist in jüngster Zeit eine Stylochus-Art, *St. albus* Hallez aufgefunden worden." In the later, more extensive description Hallez (1907) has shown that this species represented a new genus, related to the Euryleptids in *Cotylea!* At present no Stylochid is known south of 35^0 S. Lat. In the Antarctic collections of Turbellarians from the Scottish, French, German, and Swedish South Polar-Expeditions, the family is unrepresented and also for other reasons I find it very unlikely that Stylochids really exist in Antartic waters.

If we now turn to Meixner's other presumption: "Wahrscheinlich werden auch die arktischen Meere Vertreter unser Subfamilie beherbergen", it might be mentioned that it has not yet received any further support. According to Verrill, the earlier supposed occurrence of *Stylochus littoralis* Verrill at Newfoundland is of a very problematic nature, and that is also mentioned by Meixner himself. On the eastern coast of North America no other Stylochid is recorded north of U. S. A. and in the Pacific not north of Vancouver. Though it is very likely that some species might extend its distribution further north, I cannot believe that any Stylochid is able to enter Arctic waters.

As regards the European coast, we are entitled to draw a conclusion from negative facts, as we have a more extensive knowledge of the Polyclad fauna. It seems then quite improbable that Stylochids reach so far north as to the Scandinavian coast. In his "Catalogue des Turbellariés du Nord de la France de la côte Boulonnaise" Hallez does not mention any *Stylochus*-species and an occurrence of this genus in British waters is unknown. If we then

give due allowance for future finds, I should consider it unlikely that outposts may occur north of 50° Northern Latitude.

An outstanding feature in the geographical occurrence of the Stylochids is undoubtedly the fact that they have their main distribution in tropical and subtropical areas. In addition they inhabit temperated zones, but chiefly the southern parts of these. In the family, *Stylochus* is the predominating genus, and at present it really flourishes with a great number of species. Their size and the strength of body present striking features. The largest Polyclad I have ever collected was a *Stylochus* (from Misaki in Japan) and it attained alive a length of more than 1 dcm. In preserved state it surpasses 7×7 cm. Meixner also points out how the Stylochids in the tropics reach considerable sizes ("60 mm und darüber"). A similar tendency to gigantic growth of specimens in warm seas is met with in *Planoceridae,* a family having a distribution very similar to *Stylochidae,* and as examples I shall take *Paraplanocera discus* from Mid-Pacific and *Planocera reticulata* from Misaki. Among the *Cotylea* the tropical *Pericelis Beyerlana* (Collinswood) occurring from Somali at least to the Gilbert Islands and Fiji reaches an impressive dimension. The striking differences in size between the Polyclads of the Boreal fauna compared with those of the Mediterranean is also noteworthy here. *Pseudoceridae*, a Cotylean family, having a distribution similar to *Stylochidae*, luxuriates in the tropics in number of species as well as in size, but above all in the most splendid colours.

We have thus a close resemblance between *Stylochidae*, *Planoceridae*, and *Pseudoceridae* with regard to the geographical distribution and they are all typical inhabitants of warm seas. This general feature in the occurrence of these families cannot be expected to be altered in any pronounced way through an increase of our knowledge of the Polyclad faunas. Even if some outposts might be known in the future they will only constitute exceptions to the rule.

Here I may also mention that I must regard some very characteristic Polyclads of the Boreal fauna; i. e. *Discocelides, Polyposthia*, and *Cryptocelides* as a kind of substitute for the missing Stylochids. I consider these forms, together with the genus *Plehnia (Pl. arctica* and *japonica)* as not distant relatives of the *Stylochidae.*

They all show the œcological habit, for Polyclads very peculiar, of living on mud bottom, a reason perhaps why these forms of ancient organization survive in these regions. Doubtless their male apparatus is more primitive than that of *Stylochidae*. With increased knowledge of *Stylochidae* the gap between these forms and Stylochids is steadily diminished. New Polyclads from my South Sea journey complete in a desirable way our knowledge of the relationship of *Plehniidae* to *Stylochidae*.

Since Meixner's table of the geographical distribution of the *Stylochidae* seems rather antiquated now, as the number of recognized species of *Stylochidae* has augmented since its publication to considerably more than double, not to speak of the number of genera, I think it necessary to give a new table. I have arranged the many *Stylochus*-species according to occurrence. For sake of convenience I have enumerated the genera in the same order as they occur in my determination table.

Briefly summarizing the table, one finds it rather astonishing that not less than 35 Stylochids are described from the Indo-Pacific area, while in the Atlantic (the Mediterranean Sea and Black Sea inclusive) there are not more than 11 species known. After the description of my half a dozen new Stylochids from the Pacific, the difference will be yet more pronounced. A study of the table will demonstrate that all the Atlantic species but one, *Idioplanoides atlanticum* Bock, belong to the genus *Stylochus*. Of these ten Atlantic species, Europe and the United States have equal lots. I shall then direct the attention to the circumstance that none of them is common for both areas, a case perhaps worthy of renewed investigations. Fully unbelievable or unexpected the case is not, since, as a rule, the Stylochids seem to have a rather limited distribution. This has already been pointed out by Meixner, and according to the same esteemed author, is partly due to the fact that the development, as in *St. neapolitanus*, is direct. But he also calls attention to the fact that Goette and Lang have recorded a development with pelagic stages in *St. pilidium*. During my embryological researches carried out in Japan, I found the same valid for another *Stylochus* species.*)

*) This species I shall call *ferox*, as it is a voracious animal, appearing as a destroyer of young oysters.

	Mediterranean Sea incl. Black Sea	Atlantic Ocean		Indian Ocean	Pacific Ocean
Stylochus:	Med. Sea	Cape Verde?			
neapolitanus (Delle Chiaje 1841)	Med. Sea				
pilidium (Goette 1881)	Med. Sea				
plessisi Lang 1884	Black Sea				
vesiculatus Jacubowa 1909	Black Sea				
tauricus Jacubowa 1909			U. S. A.		
littoralis (Verrill 1873)			U. S. A.		
nebulosus (Girard 1853)			U. S. A.		
zebra (Verrill 1882)			U. S. A.		
frontalis Verrill 1893			Bermudas		
bermudensis Verrill 1902				Red Sea	
suesensis Ehrbg 1831				Red Sea	
coseirensis n. nom. (= *reticulatus* F. Meyer)					
djiboutiensis A. Meixner 1907				Somali	
salmoneus A. Meixner 1907				Somali	
meixneri n. nom. [= *reticulatus* A. Meixner				Somali	
(nec Stimpson)]				Zanzibar	
zanzibaricus Laidlaw 1903				Ceylon	
ceylanicus Laidlaw 1904				Siam. West Australia	Formosa
orientalis Bock 1913 var. *splendida* Bock 1913				Siam	
hyalinus Bock 1913				Siam	
marmoreus Bock 1925				Amboina	

arenosus Willey 1897					New Britain
cinereus Willey 1897					New Britain
vigilax Laidlaw 1904					Thursday Island
pusillus Bock 1913					Hongkong
rutilus Yeri et Kaburaki 1918					Japan
ijimai Yeri et Kaburaki 1918					Japan
Meixneria furva Bock 1913				Siam	
Parastylochus astis Bock 1913				Java Sea	
Ilyplana aberrans Bock 1925					New Zealand
Idioplana australiensis Woodworth 1898					Queensland
Leptostylochus elongatus Bock 1925					New Zealand
„ nov. spec. (undescribed)					Sydney
Neostylochus fulvopunctatus Yeri et Kaburaki 1920					Japan
„ *pacificus* Bock 1923					Juan Fernandez
Idioplanoides insignis (Laidlaw 1904)				Ceylon	
„ *atlanticum* (Bock 1913)			West Indies		
Limnostylochus borneensis (Stummer-Traunfels 1902)				(Borneo, fresh water)	
„ *annandalei* Kaburaki 1918				Malacca, brackish water	
„ *amara* Kaburaki 1918				Malacca, „ „	
Discostylochus parcus Bock 1925					Hawaii
Enterogonia pigrans Haswell 1907					Sydney
„ „ var. *novæ-zealandiæ* Bock 1925					New Zealand
Cyptophallus wahlbergi Bock 1913				South Africa	
„ *sondaicus* Bock 1925				Amboina	
Kaburakia excelsa Bock 1925					Vancouver
Bergendalia anomala Laidlaw 1903				Malacca	
„ *diversa* Yeri et Kaburaki (1918)					Japan

Other circumstances may, therefore, contribute to the supposed restriction in distribution, which still await direct observations, empty speculations being here of little value.

In my table Plehn's *Stylochus pilidium* from Valparaiso is not recorded, and this I have purposely omitted. Even if the determination is correct, the circumstances connected with the find (on a ship coming from Italy) forbid its being taken into account. Meixner also puts a ? in his table (but Brazil is erroneously indicated for the case).

It is undoubtedly remarkable that only two Stylochid-genera are known in the Atlantic, when all fourteen genera hitherto recognized are represented in the Indo-Pacific area. This may, however, partly be due to the fact that the Polyclad fauna in the tropical and southern Atlantic has remained practically unveiled. But we are very probably safe in assuming the former as the main centrum for the family. In this area a member of the family, *Limnostylochus borneensis*, has succeeded in invading fresh water and two others of the same genus are known to occur in brackish water. This shows a remarkable independence of salinity, the genus being in this respect unique among all Polyclads. Otherwise the Stylochids seem to be decidedly stenohaline, as they are also very likely stenotherme.

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Explanation of the Plates.

Plate III.

Stylochus marmoreus n. Sp.
Figs. 1—6.

Fig. 1. Dorsal view of the body of the smaller specimen.
Fig. 2. The type-specimen in dorsal aspect, 1, 3 x.
Fig. 3. Part of body to demonstrate the patches of pigment. 2, 6 x.
Fig. 4. The same specimen as in Fig. 1 in cedar-wood oil. On account of the rich pigmentation, the interior organs are not traceable on this photograph taken from above. Filled as they are with eyes, the tentacles appear as black spots; they are otherwise pigment-free.
Fig. 5 The type-specimen in cedar-wood oil, ventral side turned upwards and the light passing through. The branched uteri filled with eggs are discernible. The upper *ph* indicates the part of the pharyngeal fold which protrudes like a rosette through the mouth, the lower *ph* the pharyngeal pocket prolonged backwards as a very long median-placed diverticle.
Fig. 6. Brain-area (*br*) and tentacles *(t)* of the type-specimen.

Kaburakia excelsa n. g. n. sp.
Figs. 7—10.

Fig. 7. Ventral view of the largest specimen. The pharynx protrudes as an extremely folded rosette through the mouth.
Fig. 8. Dorsal view of the same specimen to demonstrate the distribution of the pigment.
Fig. 9. The smaller form (f. minor) in dorsal aspect. The specimen is sexually ripe.
Fig. 10. The type-specimen in dorsal aspect.

Leptostylochus elongatus n. g. n. sp.
Figs. 11—16.

Fig. 11. The largest specimen in cedar-wood oil.
Fig. 12. The type-specimen in cedar-wood oil, with the ventral side upwards.
Fig. 13. The same in alcohol.

Fig. 14 & 15. Ventral and dorsal view respectively of another specimen in cedar-wood oil.

Fig. 16. The type-specimen in oil, with the dorsal side upwards. It is to be observed that the large, unbranched, sinuous uteri reach more frontalwards than the very long and remarkably narrow pharyngeal chamber.

Enterogonia pigrans Haswell var. *novæ-zealandiæ* n. var.
Fig. 17.

Fig. 17. A specimen in ventral aspect to demonstrate the location of the mouth (a small part, *mp*, of the pharynx protrudes through it) and the sexual openings

Cryptophallus sondaicus n. sp.
Figs. 18—21.

Fig. 18. Dorsal aspect of the animal in alcohol. As the insignificant tentacular rudiments lack glands in the epidermis, they contrast as light spots against the other more dark-coloured surface of the body.

Fig. 19. Anterior part of the body in oil to show the simply branching intestinal coeca, the brain area, and the cerebral eyes. Dorsal side upwards.

Fig. 20. The whole animal in cedar-wood oil. *a* and *b* indicate anterior and posterior end respectively of pharynx; *eb*, excremental balls in the intestine. Ventral side turned upwards.

Fig. 21. Ventral aspect of the animal in alcohol. Through the mouth protrudes a small part of the pharyngeal fold. The location of the genital openings indicated, as they were clearly visible on the original photograph with the help of lens-magnification.

Plate IV.

Ilyplana aberrans n. g. n. sp.
Fig. 22.

Fig. 22. Part of a longitudinal section through the body to demonstrate the male and female apparatus. The cyanophile secretory glands around the prostatic vesicle carry their secretion to the antrum and empty especially on the dorsal wall of it. This part projects as a heavy prominence and obviously corresponds to a penis. The secretion partly fills the antrum and the epithelium of the penis-like body. Its extreme affinity to hematoxylin makes it appear so black.

Ehrlich's hematoxylin and eosin; yellow colour filter.

Kaburakia excelsa n g. n. sp.
Fig. 23.

Fig. 23. Part of a transverse section of the body showing a retracted tentacle. The thick muscle wall of the body disappears at the border of the tentacle. The thick basement membrane thins out at the same time

and is at the sides of the tentacle intensively folded, giving a fair idea about the contracted state of the tentacle. Remarkable is how deeply into the interior of the body the tentacular eyes are pres sed at this contraction. As more than 30 ocelli appear on this section, the picture also serves the purpose to prove their excessive number.

Enterogonia pigrans Haswell var. *novæ-zealandiæ.*
Fig. 24.

Fig. 24. Sagittal section through the female apparatus. Above the end of the indicator line for *dgi* is the entrance of the ductus genito-intestinalis into the main intestine. The main gut curves slightly sidewards in the region of the female apparatus, being dislocated by this organ. Consequently only the hinder part of the gut appears on the picture. The continuation of it anteriorwards is visible on Fig. 31, where it reappears above the male apparatus. There it is only compressed but not dislocated, as it doubtless should have been if the prostatic organ had reached due size.

Cryptophallus sondaicus n. sp.
Figs. 25—28.

Fig. 25—28. Longitudinal sections through the hinder part of the body to demonstrate excretorial canals.

Kaburakia excelsa n. g.
Fig. 29.

Fig. 29. Sagittal section to demonstrate the male apparatus. The mass of sperma fills not only the ductus ejaculatorius but also the penis canal and a part of the antrum, where it lies above the apex of the penis.

Stylochus marmoreus n. sp.
Fig. 30.

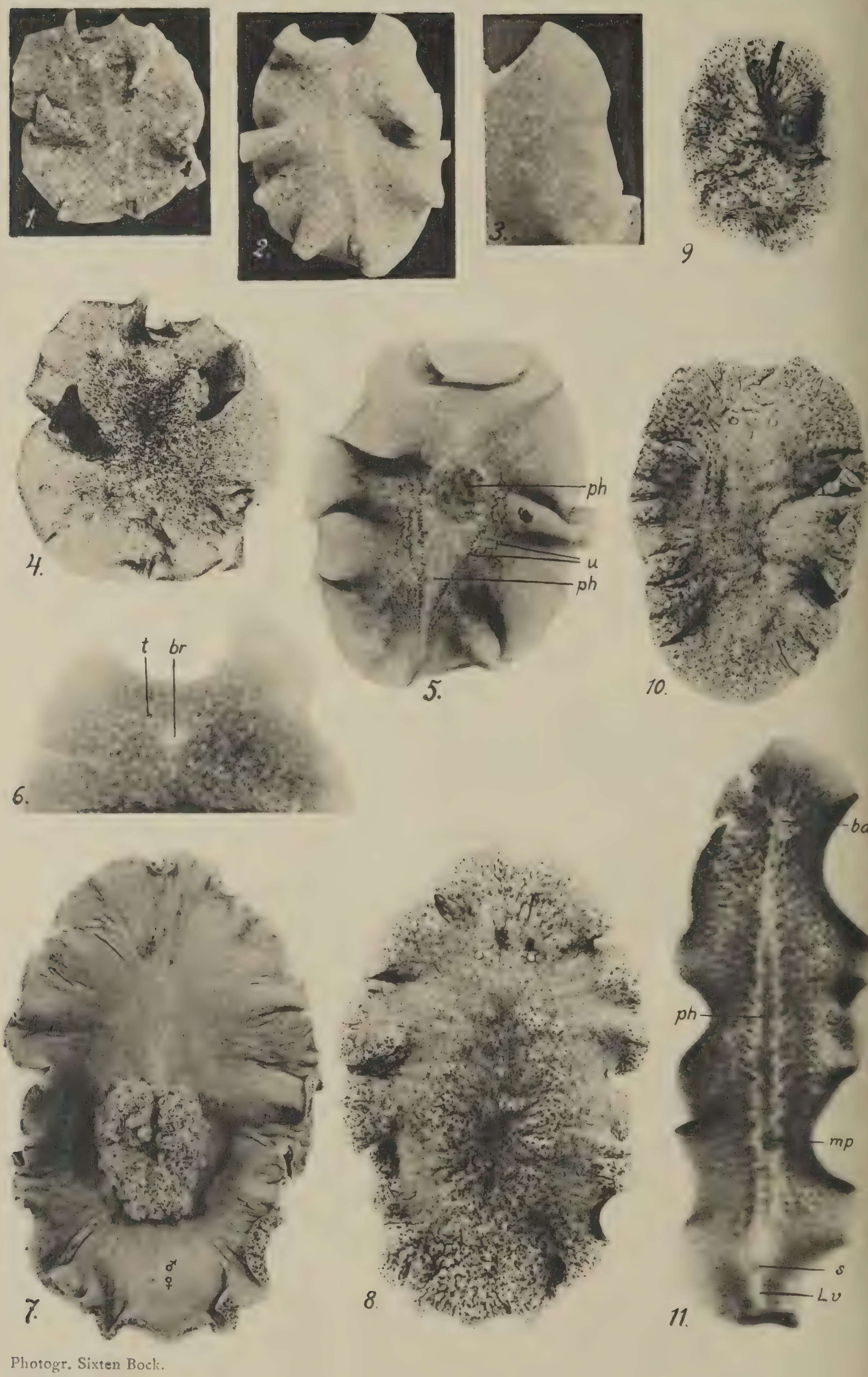
Fig. 30. Nearly longitudinal section to show the prostatic vesicle. In the interior of it there are at least 15 larger secretorial chambers visible on the picture. The light streaks in the muscularis of the vesicle represent the exits of the extra-capsular glands piercing the envelope on their way to the chambers.

Enterogonia pigrans Haswell var. *novæ-zealandiæ.*
Fig. 31.

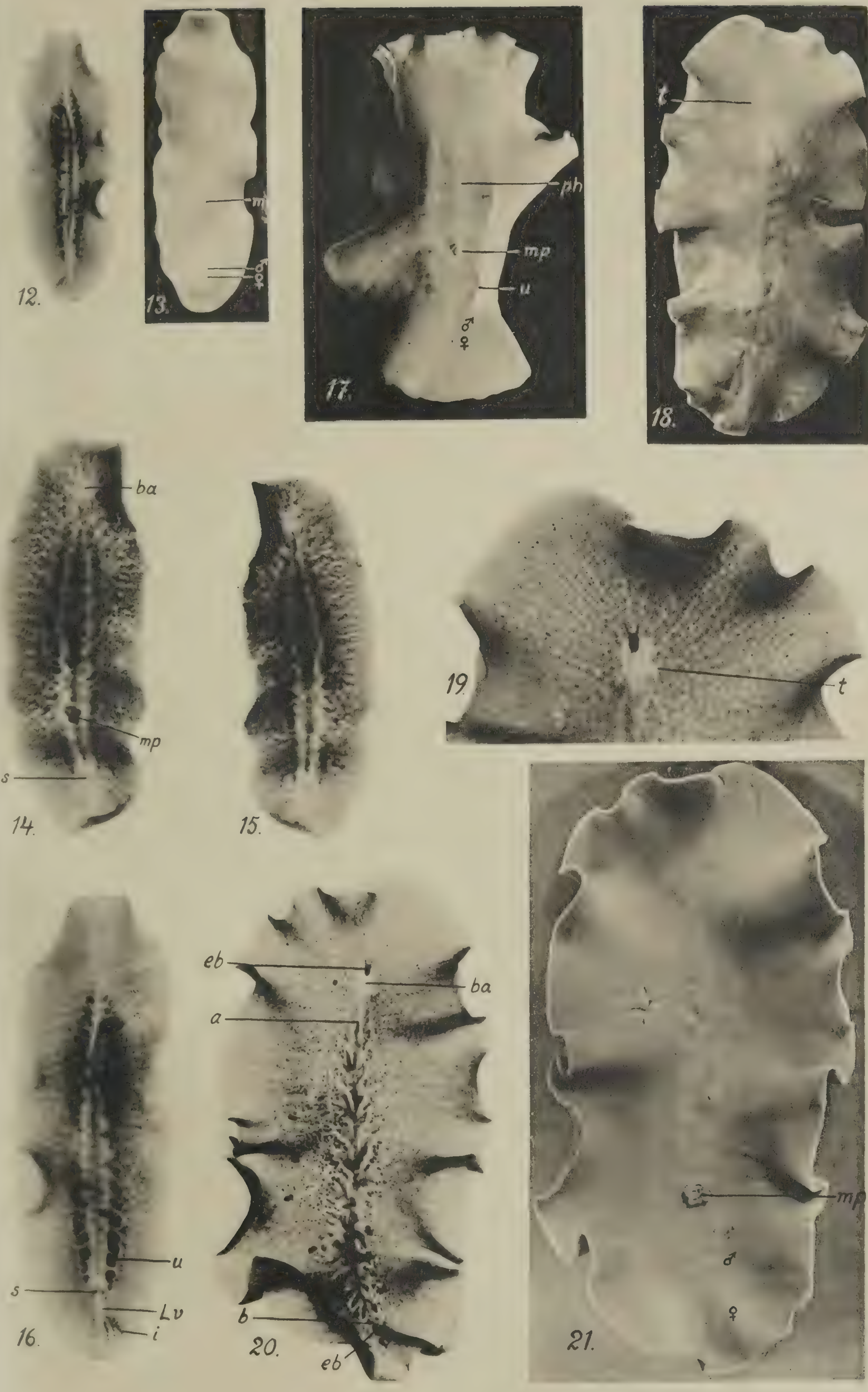
Fig. 31. Longitudinal section through body demonstrating the male apparatus.

Enterogonia pigrans Haswell var. *novæ-zealandiæ.*
Fig. 32.

Fig 32. Part of the section to show the rudimentary prostatic vesicle. The epithelium of it is ciliated. In the dorsal wall of the main gut there



Photogr. Sixten Bock.



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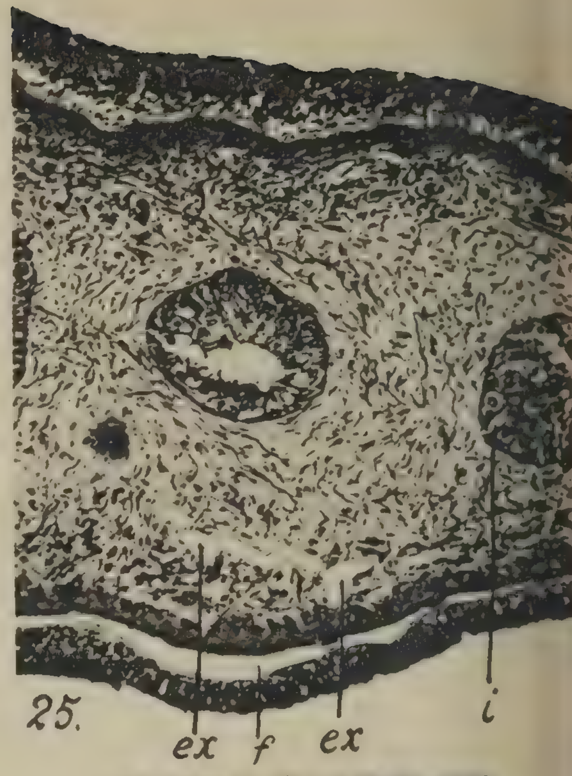
22.



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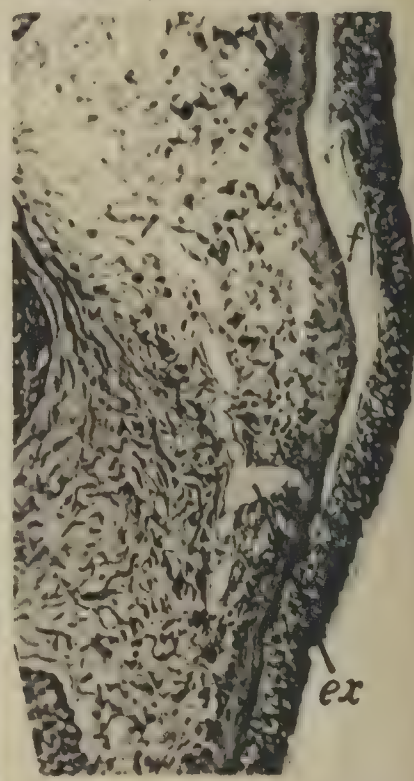

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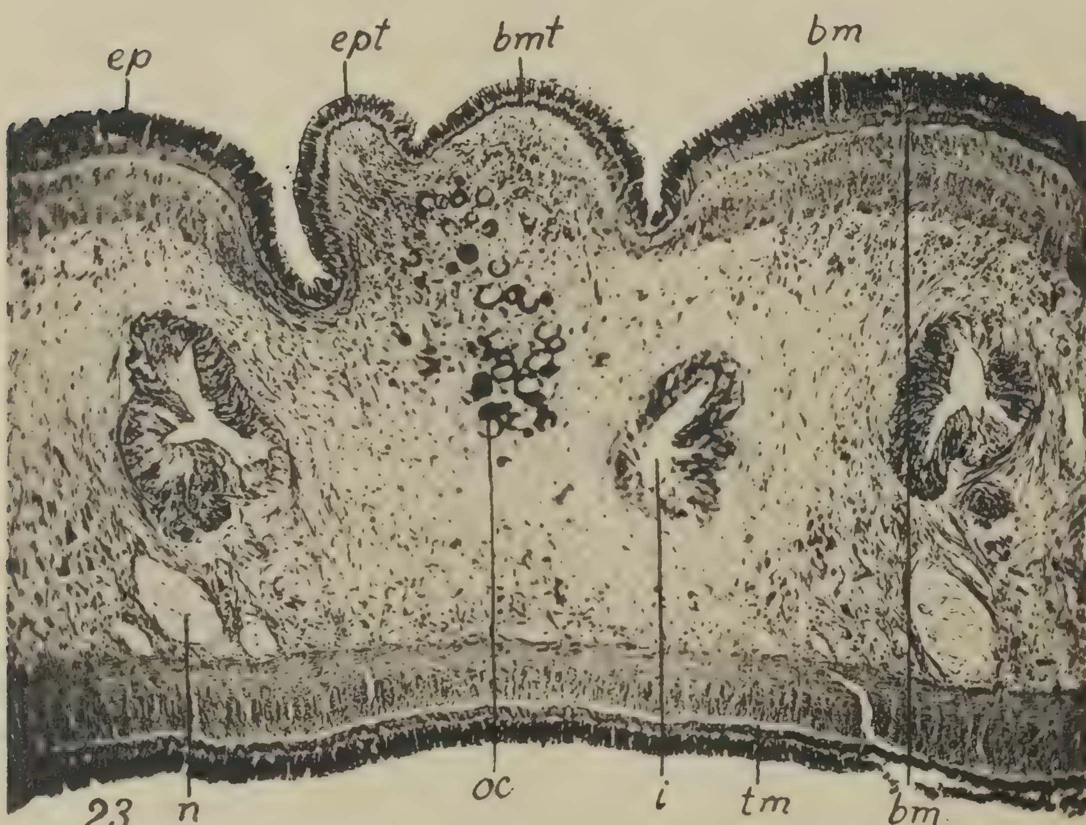

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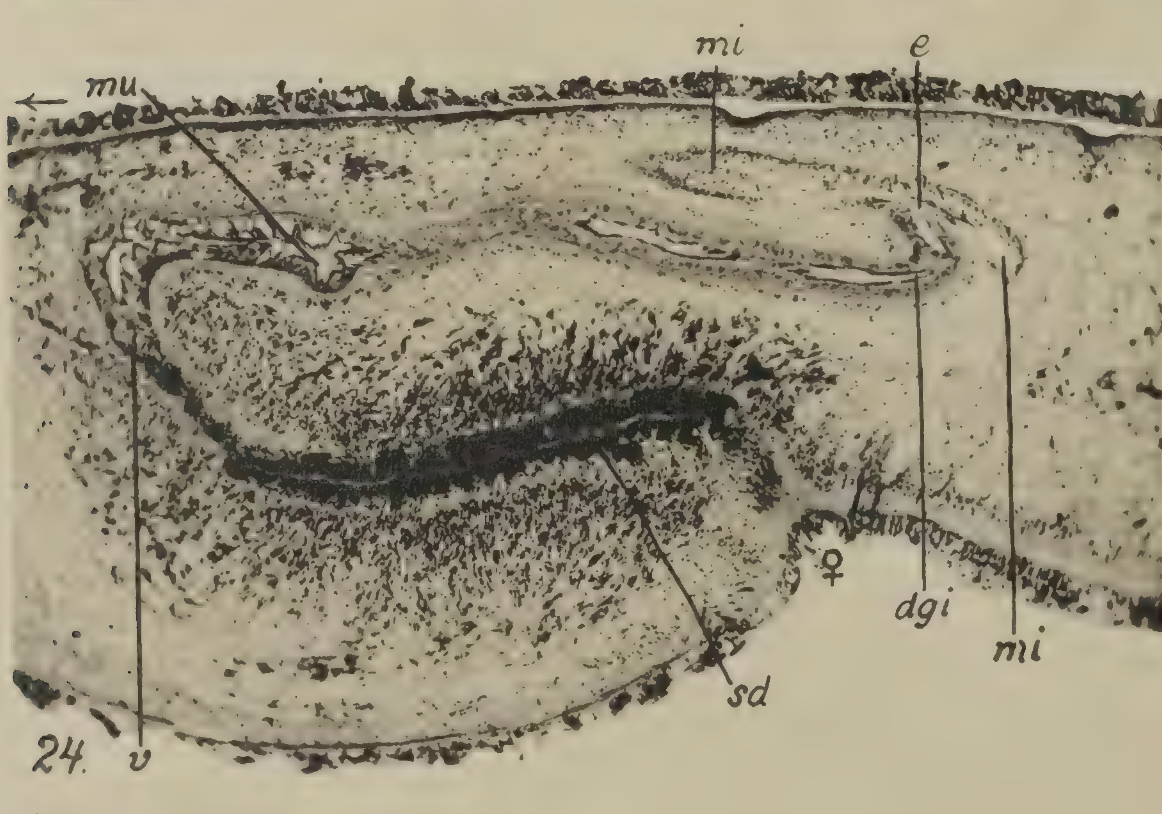

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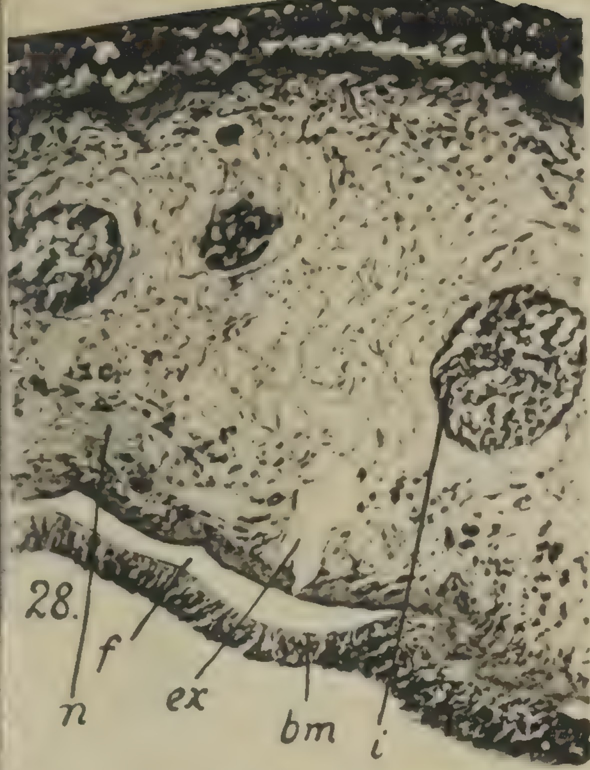
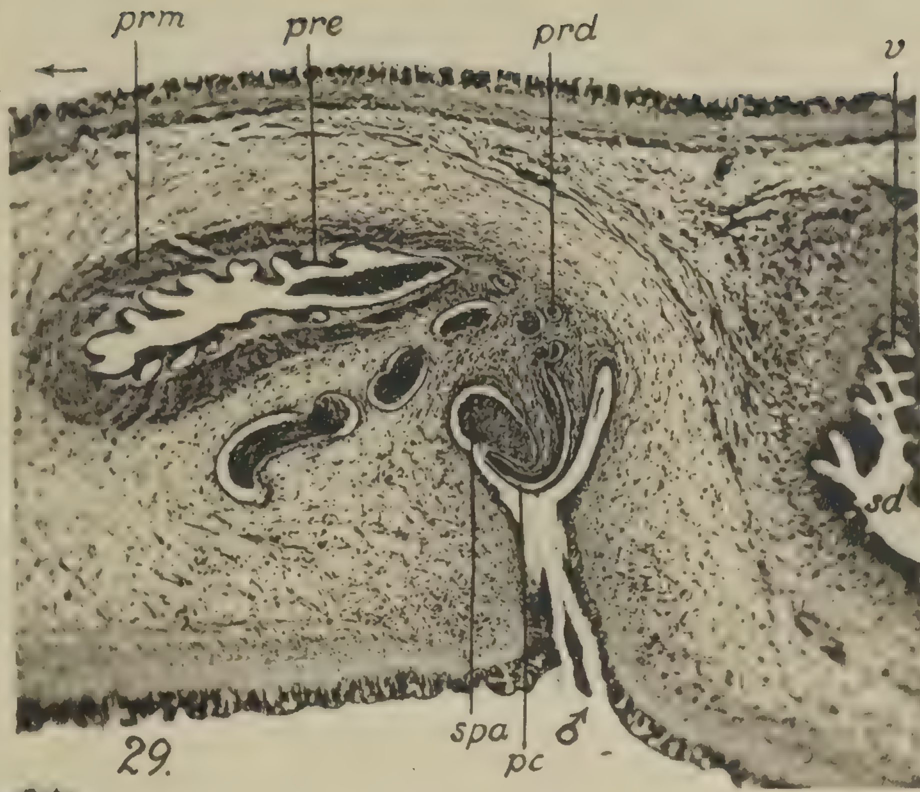
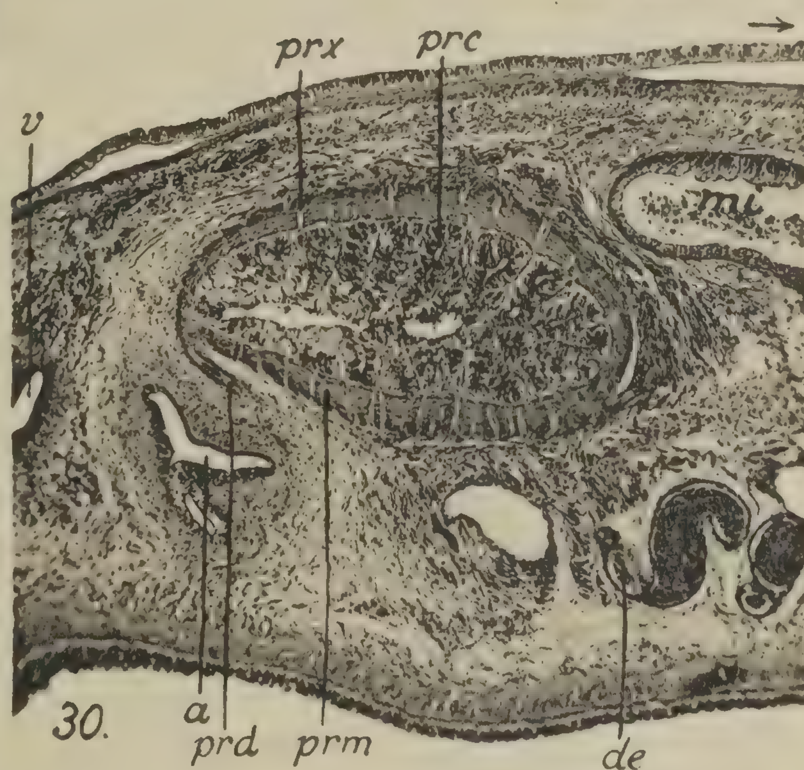
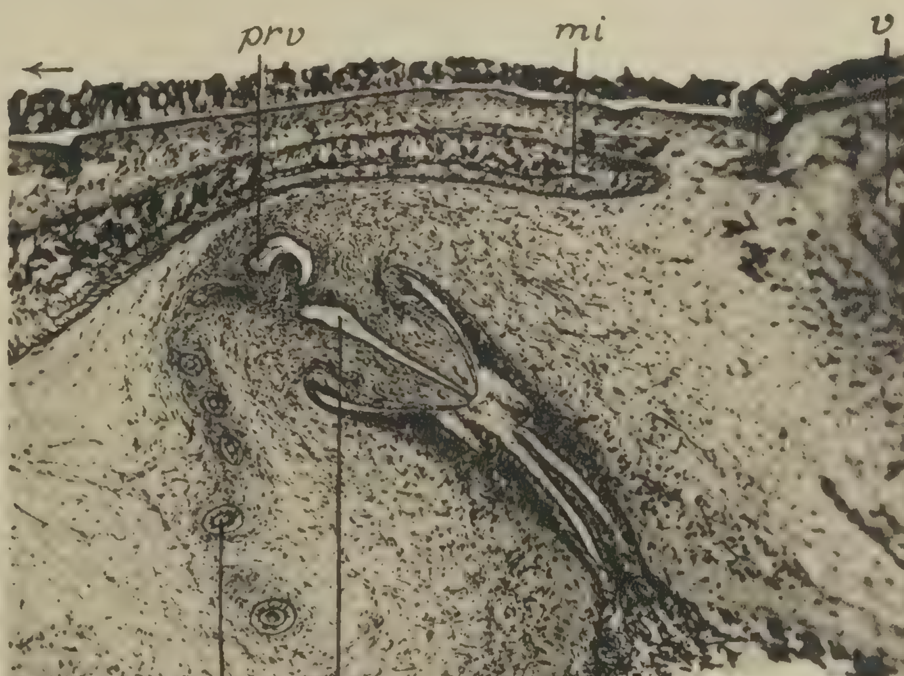
27.

Photogr. Sixten Bock.









Imp. Catala frères, Paris

are visible, as may be mentioned, Minot's granular glands ("Körnerkolben"). The ventral wall lacks them more or less completely (in fig. 31 none are present).

Explanation of letters.

a,	antrum masculinum.
bm,	basement membrane of body.
bmt,	„ „ „ tentacle.
cy,	cyanophilous glands.
de,	ductus ejaculatorius.
dgi,	ductus vagino-intestinalis.
e,	„ „ „ enters the main gut.
ep,	epidermis.
ept,	tentacular epithelium.
ex,	excretorial canal.
f,	artificial fissure between basement membrane and muscularis.
i,	intestinal branch.
Lv,	Lang's vesicle.
m,	mouth.
mi,	main gut.
mu,	median uterine duct.
n,	nerve.
oc,	ocellus.
p,	penis.
pc,	penis canal.
ph,	pharynx.
php,	pharyngeal pocket.
prd,	efferent duct of prostate vesicle.
pre,	epithelium „ „ „
prm,	muscularis „ „ „
prv,	prostatic vesicle (vesicula granulorum).
prx,	ductuli of extra-capsular prostate glands.
sd,	shell duct (ootype).
spa,	sperma ejected into antrum masculinum.
t,	tentacle.
tm,	transverse layer of muscularis.
u,	uterus.
v,	vagina.

Contents.

5—6—1925.

Papers from Dr. Th. Mortensen's Pacific Expedition 1914—16.

XXVIII.

Madreporaria I.

Fungiidae.

Systematic Description and Biological Notes of the material from the Danish Expedition to the Kei Islands 1922, Dr. Mortensen's Pacific Expedition 1914—16, and from various other localities, in the Copenhagen Zoological Museum.

By

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(From the Zoological Laboratory of the University of Leyden).

(With Plates V—XI).

During the Danish Expedition to the Kei Islands (1922) the reef-exploration was of secondary importance, the main object being the dredgings in deeper water. Therefore the collection of reef-corals from the different localities does not give an accurate idea of the number of species present in a certain locality and of their quantitative distribution. From most of the larger species of *Fungia* and the colonial Fungids chiefly those specimens were collected which showed some features of biological interest, such as budding or regeneration. The corals from the dredgings are all preserved with the exception of some too much worn-off specimens, and these therefore give an accurate indication of the species in the different localities. In the Banda Islands a native diver rendered us excellent service by collecting a large quantity of the smaller Fungiae belonging to the *patella*-group. This large material enabled me to demonstrate, that in „*Fungia patella*" of different authors a number of distinct species are united. In a former publication (1923c) I gave diagnoses of these species and some of the specimens dealt with in this paper are already described and figured there.

I desire to express here my sincerest thanks to Dr. Th. Mortensen, who kindly put the whole of the material from the Danish

Expedition to the Kei Islands at my disposal, and who also arranged during this expedition that much time was devoted to the collecting of certain corals which I wanted in large quantities, e. g. the Fungiae of the *patella*-group. Besides this material Dr. Mortensen also sent me the corals from his Pacific Expedition (1914—16) and other Madreporaria from the Copenhagen Zoological Museum to be worked out in connection with the corals from the Expedition to the Kei Islands.

A large number of specimens were lent to me for comparative study by Dr. L. F. de Beaufort (Zoologisch Museum, Amsterdam), Prof. E. D. van Oort ('s Rijks Museum van Natuurlijke Historie, Leyden.), Mr. C. Forster Cooper (Zoological Museum, Cambridge, England), and Prof. M. Bedot (Muséum d'Histoire Naturelle, Genève). To Dr. C. J. van der Horst I am indebted for much valuable information concerning the material of the Siboga Expedition. During a visit to the United States Dr. P. Bartsch kindly allowed me to study Dana's types and other corals in the U. S. National Museum in Washington, and supplied me with photographs of some specimens. A year ago Dr. C. J. van der Klaauw already had sent to me elaborate notes and photographs of *Fungia crassa* Dana from the same Museum. To Mr. S. Henshaw and Dr. H. B. Bigelow I owe the opportunity of studying a number of Verrill's types and other corals in the Museum of Comparative Zoology in Cambridge (Mass.).

I wish to thank all the above-named gentlemen for their help which enabled me to identify a great deal of my material with more accuracy.

Fungia Lamarck.

As already has been proved sufficiently by Döderlein (1902) and Vaughan (1907) there is no reason to separate *Cycloseris* as a distinct genus from *Fungia*. One of the characteristics by which these two could be separated as different genera was found in the development of the first cycle of septa: *Cycloseris* in its youngest stage according to Gardiner (1899) has six septa, *Fungia* after Bourne (1893) twelve. In Bourne's material of *Fungia* apparently the very youngest stages were not found, for in *Fungia fungites* the six septa of the first cycle appear before those of the second. These young stages I found (1923a) as buds which developed from

the living parts of large specimens in which the mouth and its surroundings were destroyed. The further development of these buds took place in quite the same way as in normally developing anthoblasts and, therefore, we may assume that also the very young anthoblasts of *F. fungites* which have developed from planulae have only six septa. Moreover the specimens described by Gardiner as *Cycloseris hexagonalis* do not in reality belong to this species. I have examined a number of Gardiner's specimens and as I already pointed out elsewhere (1923c) these have to be placed in Döderlein's *repanda*-group. Therefore from none of the species of the former genus *Cycloseris* (i. e. the *patella*-group) the youngest stages are till now described. Fortunately I have in my material a large amount of specimens with very young buds, belonging to two species of the *patella*-group, viz. *Fungia hexagonalis* and *marginata*, and in each of these two the first six septa develop before the septa of the second cycle make their appearance. The development of the first cycles of septa therefore presents no difference between *Cycloseris* and *Fungia*.

Often specimens of *Fungia echinata* are found in which the axial fossa has been divided into several components which results in the formation of a colonial corallum. These specimens have developed abnormally, for as a rule *F. echinata* is a simple form and therefore there is no reason to separate these compound specimens from it as representatives of another genus. Also in other species budding or fission gives often rise to a quite unusual form of corallum. In the following pages some compound coralla are described amongst the species of *Fungia*, but all these are abnormal representatives of a species which usually has a simple mouth (cf. *F. fungites* and *F. moluccensis*). It is, however, quite a different case when from a certain species only compound adult coralla are known. In this case the colonial form is a feature inherent to the species and it must then be classified in another genus. Therefore in this paper the species *Herpolitha* (*Fungia*) *simplex* Gardiner and *Fungia weberi* van der Horst are placed in the genus *Herpolitha* on account of the fact that their axial fossa has undergone fission by the fusion of pairs of opposite septa across it.

For the greater part of the species of *Fungia* I have not given the complete list of synonyms; these are, however, to be found

in the works cited under each of the species. The arrangement of the species is chiefly based upon Döderlein's (1902) monograph on this genus.

Fungia hexagonalis M.-E. & H.

(Pl. V, figs. 1—11, Pl. XI, figs. 136, 137).

Fungia hexagonalis Milne Edwards & Haime 1848.
Cycloseris hexagonalis Milne Edwards & Haime 1851.
Cycloseris hexagonalis Milne Edwards 1860.
Cycloseris tenuis Moseley 1881.
Fungia patella Döderlein 1902 p. p.
Fungia patella van der Horst 1921 p. p.
Fungia tenuis Boschma 1923c.
(non: *Fungia tenuis* Dana 1846!)

Localities: D. Exp. t. Kei Isl.: Banda Islands, chiefly between Goenoeng Api and Neira, but also some specimens off Lontor, 10—30 m, 512 ex.

In a previous paper (1923c) I have identified the specimens in my material, which belong to *F. hexagonalis*, with *F. tenuis* Dana. The figure and the description of this form by Dana made it highly probable that the specimen was identical with *F. hexagonalis*, especially on account of the fact that Dana mentioned the undulating margin as one of its peculiarities. Moreover the specimen figured by Moseley, referred by this author to *F. tenuis*, undoubtedly was a representative of *F. hexagonalis*.

After I have studied the type-specimen of *Fungia tenuis* in the United States National Museum I am convinced that it belongs to quite a different form, and even that *Fungia tenuis* does not belong to the *patella*-group. Probably the specimen is a young form of one of the larger Fungiae. The lower and upper surface of the type-specimen of *F. tenuis* is represented in figs. 136 and 137. The costae are visible as small ridges in the marginal part. The scar of detachment is, though very vaguely, still visible in the central part. It is comparatively large (diameter about 7 mm). The septa have a sharp edge with only small dentations. The marginal part of the corallum is very thin, but this peculiarity is usually seen in recently detached coralla of the larger species of *Fungia*.

Consequently the specimens in my material have to keep the name *Fungia hexagonalis* M.-E. & H. The characteristics of this species have been sufficiently dealt with in my above-cited paper,

where also the young stages which had but recently detached themselves from their stalk are described. As among the large material there are several specimens showing phenomena of budding, fission or regeneration, some of these may be described here at some length.

In the collection there are a number of specimens in which a portion of the living tissues had died off, whilst buds had developed from the remnants of the living parts of the corallum. Some very young stages of these buds are found in one specimen of which only a small portion of the upper surface has lost its soft parts. Beneath this dead portion ten buds have grown out, three of which were still surrounded by the living tissues of the mother-corallum. From the remaining portion the soft parts must have but recently died, as the corallum is not yet overgrown with foreign organisms. In the youngest bud of this specimen, which has a diameter of about half a mm, the theca is well-developed; one septum is visible and traces of a second one next to the first. A slightly more developed bud possesses the six septa of the first cycle, inserted at equal distances on the theca. Here also the columella has made its appearance as small excrescences from the basal parts of the bud. One side of the theca of this bud is somewhat irregular, as a double wall seems to have developed in one place. In the larger buds the further stages of development are visible, some of them having two complete cycles of septa, whilst in the largest one in this specimen (measuring 2 mm in diameter) the third cycle is nearly complete.

The largest bud in my material, developed in this way (fig 8), has five complete cycles and a few septa of the sixth cycle, its greater diameter being 19 mm. This bud was still attached with a short stalk to the old corallum, though it had already surpassed the stage in which the buds which have developed from planulae fall off from their anthocaulus. Its costae are stronger developed than in normal anthocyathi of the same size. The same phenomenon is found in buds developing in this way in *Fungia fungites:* these have also more prominent costae provided with stronger spines than those in anthocyathi of equal size developed from planulae.

In the above specimens only a small portion of the corallum died and only a few buds arose from the remnants of the tissues

of the dead parts. When, however, the decay of the soft parts spreads over a greater portion of the corallum and especially when the mouth also looses its living parts, a great many buds originate from isolated patches of living tissue, especially in the marginal region. A very fine instance illustrating this phenomenon is represented in figs. 1 and 2. In this specimen the corallum has died off, but from the remainder of the living parts of the margin 94 buds have developed, a great many of which show a broadening of the anthocaulus under the present anthocyathus, indicating that already a former anthocyathus has detached from it. In the largest buds still found on this dead specimen three complete cycles of septa and a few members of the fourth cycle are visible, their longer diameter amounting to 3 mm. The largest of these buds have already assumed a hexagonal form (fig. 3).

Two specimens in the collection furnish a very curions example of regeneration. In each of them the central part with a greater diameter of 25 mm has been more or less separated from the marginal part by a suture. These irregularities have come about in the following way: When the corallum reached a size of about 25 mm part of it lost its living tissue, which brought about the formation of buds in the neighbouring portion. In one specimen three buds are present, in the other ten. Apparently the growth of the corallum stopped for some time after part of the tissues died off. Afterwards a new part of the theca arising from the centre of the corallum formed itself and grew out over the dead part. In most parts of the margin of the old corallum this new theca has fused with the old one, but the difference in thickness of the two parts is still clearly noticeable. At first sight these coralla seem to be the outcome of a fusion of two individuals. That the only true interpretation is the one given above is borne out by the comparison with other specimens in which also this kind of regeneration has taken place, but at a less advanced stage.

Fig. 10 represents a specimen showing the first traces of such a regeneration. The living part next to the defunct portion has formed a kind of ridge. In the course of further development a new theca may grow out from this ridge overlapping the dead portion. When at last the new-formed parts reach the margin of the dead portion, the corallum seems to consist of two discs that

have fused together. The phenomena in the marginal parts of the *Cycloseris*-form of *Fungia distorta,* as described by Döderlein (1902), lead to a form of corallum similar to these specimens of *F. hexagonalis.* With the latter species it is always obvious that the apparent doubling of the margin was caused by regeneration.

In many cases the regeneration of the defunct parts by means of a new theca over the old causes irregularities, as for instance in the case of the specimen of fig. 7. Parts of the margin of this specimen have died off and the neighbouring portions in their further growth spread towards these dead regions, the septa and costae assuming a curved course. The corallum now shows some resemblance with a *Diaseris*-form, in which also the septa in each lobe strongly diverge. Here, however, the lobes are connected by outgrowths of the corallum above the dead parts, so that no clearly marked divisions between the lobes exist as in the case of the *Diaseris*-forms.

Sometimes these lobes in regenerated coralla have the septal arrangement so characteristic in *Diaseris*-specimens. One of my specimens (fig. 6) has regenerated from one half of a broken corallum, as a ridge at the lower surface indicates. The greater part of the disc has regenerated to a sector that completes the larger portion of the remaining half; in a smaller section, however, the septa strongly diverge whilst they are curved, having assumed in this way quite a *Diaseris*-like appearance.

Phenomena of regeneration often lead to the formation of a number of secondary mouths. One specimen illustrating this fact (fig. 11) has very irregularly regenerated. Nearly half of the corallum broke off as it appears and was afterwards partly restored. The septa and costae of this portion are arranged more or less at right angles to those of the rest of the corallum. At least six mouths are present, arranged on every side of an abnormal protuberance from the disc. It is obvious, especially at the lower surface, that the further regeneration of this specimen would lead again to an approximately circular corallum and not result into a *Diaseris*-form.

Among the material are a few specimens that possess two mouths of equal size, apparently the results of fission of the mouth into two halves. The septa around each new mouth are partly the regularly arranged old ones, partly new ones formed between the

two mouths. In the region that divides the two parts of the corallum the theca often shows large folds where the new formed septa have developed (figs. 4 and 5). Some of these specimens with two mouths may also have resulted from the fusion of two anthoblasts, as in some cases a distinct groove is visible at the lower surface, dividing the corallum into two halves. But as the scar of detachment has completely vanished, there is no definite proof that fusion has taken place. These phenomena of fission in one anthoblast or perhaps of fusion of two antoblasts often lead to irregularities in the growth of the parts between the two mouths. The parts of the theca with the new septa, which develop at this spot have little room to grow and therefore the theca is often folded upwards forming irregular excrescences. The specimen of fig. 4 already possesses such protuberances in the marginal part of the corallum. In a more irregular specimen the central part of the corallum between the two mouths shows a double vertical protrusion on which new septa were formed.

In *Herpolitha* (after Studer 1880) sometimes parts of the margin of the corallum fold outwards till they come to be situated on the lower surface. When these parts become isolated from the upper surface of the corallum, which often takes place after further growth of the margin of the corallum, they strongly resemble buds. These false buds too occur sometimes in *Fungia fungites* (Boschma 1922, 1923 b). In one specimen of *Fungia hexagonalis* a similar formation of a false bud has taken place (fig. 9). A portion of the corallum was more or less cut off from the rest and bent downwards by the folding of the margin. In this portion a mouth had originated, around which the septa (which partially are portions of the old septa and partially new) are more or les radially arranged.

Fungia patelliformis Boschma 1923 c.

(Pl. V, figs. 12—14 and 21).

Localities[1]): *Cycloseris*-specimens:

D. Exp. t. Kei Isl.: (Stat. 10, 50 m, 1 ex.; Stat. 16, 50 m, 2 ex.;) Stat. 19, 20 m, 14 ex.; (Stat. 20, 50 m, 1 ex.; Stat. 24, 100 m, 2 ex.; Stat. 39, 60

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[1]) The exact places of the Stations are given in Dr. Th. Mortensen's paper: The Danish Expedition of the Kei Islands. Vid. Medd D. Naturh Foren. Bd. 76. 1923. p. 91—99. The localities where the species was found only in a dead state are put in brackets.

m, 3 ex.; Stat. 53, 85 m, 2 ex.;) Banda, off Neira, ca. 20 m, 2 ex.; (Banda, off Selamo, ca. 70 m, 1 ex.; off Samalona, near Macasser, 15—20 m, 1 ex.; Stat. 99, 25 m, 4 ex.)

Koh Mesan, Siam, 27 m, 3 ex. Dr. Mortensen leg. 1900; North of Koh Kahdat, Siam, 7—9 m, 3 ex. Dr. Mortensen leg. 1900.

Dr. Mortensen's Pacific Exp.: Honolulu, 18—72 m, 3 ex.

Diaseris-specimens:

D. Exp. t. Kei Isl.: (Stat. 10, 50 m, 3 fragments); Stat. 19, 20 m, 1 frgm.; (Stat. 24, 100 m, 2 frgm.; Stat. 25, 85 m, 1 frgm.; Stat. 53, 85 m, 3 frgm.; Banda, off Lontor, 14 m, 57 frgm.; (Banda, various localities, 70—100 m, 46 frgm.; off Samalona, near Macasser, 15—20 m, 3 frgm.;) Stat. 65, 25 m, 8 frgm.; Stat. 82, 35 m, 4 frgm.; (Stat. 106, 32 m, 2 frgm.; Stat. 116, 22 m, 1 frgm.)

North of Koh Kahdat, Siam, 7—9 m, 7 frgm., Dr. Mortensen leg. 1900.

Dr. Mortensen's Pacific Exp.: Jolo, Sulu Islands, ca. 45 m, 1 frgm.; (Honolulu, 18—72 m, 3 frgm.)

In the young stages of this species the hexagonal shape of the corallum is less pronounced than in *F. hexagonalis*, though the septa of the lower cycles are much higher than those of the higher cycles.

In specimens preserved in alcohol the different cycles of tentacles are often clearly to be distinguished; a very typical example showing this arrangement is represented in fig. 13.

When broken, the *Cycloseris*-specimens of *F. patelliformis* usually regenerate to a circular form which shows some irregularities in the course of the septa. Here the regenerated part does not grow out as wedge-shaped sectors separated by grooves, as in *Diaseris*-forms. Therefore the two different forms of growth in *F. patelliformis*, the *Cycloseris*-and the *Diaseris*-forms, are not so closely connected as it would seem at first sight. One would expect that fragments of a *Cycloseris*-form would give rise to the formation of *Diaseris*-specimens, but in my material the great majority of these broken *Cycloseris*-specimens are regenerated into more or less complete *Cycloseris*-forms. Besides these there are a number of intermediate stages, regenerated coralla, which are no true *Cycloseris*-specimens, and neither have the pronounced characteristics of the *Diaseris*-form. Some specimens illustrating this kind of regeneration I have already described in my former paper (1923c) on the species of the *patella*-group. The short description in the following pages of some more regenerated specimens of *F. patelliformis* will show that

this phenomenon takes place here in quite the same way as in the larger Fungiae, e. g. in *F. actiniformis* and *F. fungites*.

One specimen shows the beginning of the regeneration of a broken corallum into a circular form. Somewhat more than half of the original corallum is lost, the greater part of the axial fossa is yet present. The regeneration is in an early stage: only a small border has originated along the fracture. The new-formed septa (and costae) near the axial fossa are radially arranged around the mouth; the other new septa have grown together with the larger septa of the original part of the corallum. They are sometimes nearly at right angles to the larger septa. Probably the greater part of this regenerated specimen is itself also the result of a previous regeneration as may be concluded from a ridge at the under surface from which the costae to a certain degree diverge towards either side. The septal arrangement at the corresponding part also gives an indication as to the previous regeneration. In another specimen (fig. 21) a small sector has regenerated into an oval shaped corallum with an excentric mouth. The marginal parts of the septa and costae are distinctly arranged in a radial manner around the central part of the corallum. Many of them are curved at the point where the regeneration has begun and they represent therefore some irregularities. The ultimate result of this manner of regeneration is a completely circular stage. One specimen in the collection has regenerated from about one half of a broken corallum as is indicated by a ridge at the lower surface. The upper surface is only slightly irregular owing to the regeneration, which manifests itself in the somewhat curved shape of some of the septa. The corallum now has a neatly circular shape and its upper surface hardly shows any differences from quite normal specimens.

In the above-mentioned specimens no fissures between different regenerated lobes are present and even the marginal part possesses no notches as in *Diaseris*-forms. In other regenerating specimens the lobes are less solidly fused and therefore the corallum has a much more *Diaseris*-like appearance. The specimen of fig. 12 has regenerated from a very small fragment, from which at the central parts (next to the axial fossa) three large lobes have grown out, which are only separated by sutures. At the margin of the corallum notches are to be seen between these lobes. There are in the

collection a great number of specimens of *F. patelliformis* showing this process of regeneration. The greater part of these specimens were collected by Dr. Mortensen in different localities in the Siamese waters. They all possess the *Diaseris* like lobes with a curved shape of the costae and septa. One specimen from this locality which has a nearly complete circular form, is represented in my previous paper on these corals (Boschma 1923, figs. 13, 13a). At the lower surface of this specimen the fissures between the different lobes are still clearly visible. The upper surface is at first sight hardly to be identified as a regenerated specimen, the course of the septa showing only very few irregularities.

In most of the specimens regenerated in this way the fissures between the different lobes are still clearly visible. In the course of further growth the different sectors may fuse together and then only a suture is left. The corallum then shows a *Cycloseris*-form that has developed from a *Diaseris*-form. When the different lobes are strongly fused the corallum usually has become much thicker and often assumes a somewhat arched form. The notches in the marginal part may in these specimens almost completely vanish.

The corallum represented in fig. 13 is also in some respects an intermediate stage between *Cycloseris* and *Diaseris*. The original part of it was less than a half of a broken corallum, as a ridge at the lower surface indicates. Some parts of the corallum have grown out as lobes which are separated in the marginal part by sutures. The septa next to these sutures have assumed a more or less curved shape as is also the rule in true *Diaseris*-specimens. The central part of the corallum, however, shows no traces of sutures, whilst in *Diaseris*-forms these sutures usually are visible from the margin to the centre.

In one of the specimens which have regenerated from a small fragment the old mouth has undergone fission by the fusion of two opposite septa.

True *Diaseris*-forms of *F. patelliformis* are found in great quantity among my material. Most of them have fallen asunder into separate wedge-shaped fragments. A few of these pieces are strongly lobate at the margin (fig 14).

Fungia fragilis (Alcock).

(Pl. V, figs. 18 and 19).

Fungia fragilis Boschma 1923c.

Localities[1]: *Cycloseris*-specimens:

D. Exp. t. Kei Isl.: (Stat 39, 60 m, 3 ex.)

Dr. Mortensen's Pacific Exp.: Jolo, Sulu Islands, ca. 45 m, 16 ex.

Diaseris-specimens:

D. Exp. t. Kei Isl.: (Stat. 10, 50 m, 1 frgm.; Stat. 53, 85 m, 2 frgm.; Banda, various localities, 25—100 m, 50 frgm.; off Samalona, near Macasser, 15—20 m, 2 frgm.)

Dr. Mortensen's Pacific Exp.: Jolo, Sulu Islands, ca. 21 m, 2 ex.

Some of the Cycloseris-specimens of *F. fragilis* show a superficial likeness with the figure of *Cycloseris mycoides* Alcock, but this latter species has a loosely reticulate columella, whilst the columella in *F. fragilis* consists of a great number of small rounded isolated papillae.

A number of specimens are much thicker than others, their septa are stronger and possess somewhat larger dentations which are also more regularly arranged than those of the more delicate specimens. In some of these thicker specimens there is also a slight difference in height between the marginal part and the central part of the septa of the lower cycles: these diminish in height where they unite with two septa of a next higher cycle. In the central part of such a corallum the septa of the lower cycles are easily to be distinguished by their greater prominence. The structure and arrangement of the septal dentations and granules and of the costal spines is quite the same as in specimens in which the septa are all of equal height, and therefore this prominence of the chief septa is only due to the stronger development of the corallum as a whole.

In many specimens the upper surface is strongly convex, the lower surface concave. This is the case in all the larger specimens from Jolo, which therefore possess a very peculiar form (figs. 18 and 19). Some measurements in mm of specimens from Jolo are given in the following table.

Among the material of the Siboga Expedition there are two specimens from Stat. 315 (Paternoster-Islands) which are almost

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1) cf. foot-note on p. 192.

flat though their length and breadth exceeds that of the highly arched specimens from Jolo. This variability in shape in the *Cycloseris*-form of *F. fragilis* may be caused by local influences. In

Greater diameter	Lesser diameter	Height
53	52	29
42	39	21
41	41	14
34	32	17
34	30	10
32	30	7
27	26	8
21	20	4
17	16	3
7	6	2

comparison with the specimens from Jolo, the specimens from Stat. 39 are very thin and nearly flat. All of them possess a distinct scar of detachment.

Irregularities on the upper surface of a corallum as may be brought about by parasites or by fractures usually stimulate the corallum to processes of growth in the neighbourhood of these spots and this often results in the formation of new mouths. In one specimen three small secondary mouths have originated on the upper surface. The septa in the neighbourhood of these mouths converge a little towards one another. These secondary mouths may have arisen as the result of the loss of the septa at this place. The new-formed septa are clearly to be distinguished from the unaltered parts of the old septa, being much thinner and more equal in thickness. They are also separated from the older ones by a sharp limit, and it is therefore obvious that the new mouths have arisen as the result of the damage which the corallum had suffered in the past. Another specimen in which calicular budding has taken place possesses a secondary mouth only a little smaller than the primary one, which has developed at some distance from the old mouth; it has a regular papillate columella. Between the two mouths an excrescence has arisen with a sharp edge in the middle where the septa from each side meet.

As in *F. patelliformis* in *F. fragilis* also a broken part of a *Cycloseris*-form may grow completely into a circular corallum. One specimen in the collection has regenerated from one half. On the upper surface hardly any irregularity is to be seen, whilst on the lower surface the line of fracture is still clearly visible. The result of the regeneration is a very regular corallum of the *Cycloseris*-form.

Most specimens of the *Diaseris*-form in my collection are wedge-shaped fragments of various size and breadth, the greater part of which were dead when collected. The largest fragment obtained has a radius of 28.5 mm, its breadth is 32 mm. In the central part of many of these wedge-shaped fragments new lobes have been formed in the usual way. Some specimens are composed of almost equal lobes.

Fungia laciniosa nov. sp.

(Pl. V, figs. 15—17 and 23).

Localities: D. Exp. t. Kei Isl.: Banda, between Neira and Goenoeng Api, 20—30 m, 26 ex. (including a stalked anthoblast.)

Corallum more or less circular, comparatively thin, especially in the marginal parts. Wall imperforate. Aboral surface flat or slightly concave. Marginal parts of the costae forming small lamellae covered with minute spines, every fourth costa is more prominent than the interjacent ones. Towards the centre the costae become less prominent, the central part of the aboral surface is densely covered with minute spines. The outline of the scar which is visible in most specimens, is less distinct in the larger specimens, in some cases it has vanished. Oral surface more or less curved, sometimes the central part a little elevated. Length of the axial fossa about twice its breadth. The columella is rudimentary, consisting of some irregular papillae. Septa presenting a very peculiar ragged appearance; they are irregularly fenestrated, with dentations separated by conspicuous incisions; their sides are irregularly thickened and granulated, the whole presenting thick, porous lamellae with an almost spongy appearance. The central parts of the septa of the fourth and higher cycles have fused with one of the preceding cycle, which after this fusion suddenly becomes much lower. No distinct tentacular lobes. Synapticulae clearly visible, well developed.

Figs. 15 and 16 show the upper surface of one specimen and

the lower surface of another. The smallest anthocyathus found free is represented in fig. 17. It has an obvious scar of detachment.

This species is easily distinguishable from all other ones of this group by its extremely irregularly dentated and fenestrated septa. It has some resemblance with *F. patelliformis*, but its septa have a quite different form. Moreover in *F. patelliformis* the costae are visible from the periphery to the centre, whilst in *F. laciniosa* the central part of the costae is less distinct. From *F. erosa* Döderlein *F. laciniosa* also differs by having much less prominent costae and especially by its peculiar thick, spongy septa.

The smallest specimen is a short stalked anthoblast (fig. 23), the anthocyathus of which has a greater diameter of 6, a lesser diameter of 5,5 mm. The measurements of a number of larger specimens are given in mm in the table below:

Greater Diameter	Lesser Diameter	Height
10	9	2.5
12.5	12	3
16	16 5	4
20	20	5
25	26	7
33	32	8
39	38	7
44	41	12

The largest specimen in the collection has six complete cycles of septa and some members of the seventh cycle.

One specimen has apparently regenerated from about one half of a broken corallum. The outcome is a nearly circular form with only few irregularities in the arrangement of the septa. Its lower surface presents only indistinct traces of the former incompleteness.

Fungia marginata Boschma 1923c.

(Pl. V, fig. 22, Pl. VI, figs. 50—54).

Localities: D. Exp. t. Kei Isl.: Banda, chiefly off Lontor, 10—20 m, 73 ex.

In the various stages of growth this species is always easily to be distinguished from the other ones of the *patella*-group by

its thicker margin. In the very young stages already the peripherical part of the costae is strongly developed whilst the central part is wanting. The largest specimens have a strongly developed thickened marginal part, in one of these (fig. 51) the margin is so strongly curved and thickened that it rises in some parts considerably above the centre of the corallum.

Among the large material there are a great number of specimens in which phenomena of budding, fission or regeneration have taken place. In one specimen the mouth has split up into two about equal halves. Round the new mouths the central parts of the septa of each half of the corallum are more or less radially arranged. Two septa have fused and separate the two halves of the corallum. Another specimen possesses two irregular excrescences on the upper surface. Beside one of these excrescences two secondary mouths have been formed.

In the specimen represented in fig. 50 one part of the margin has a kind of fold. At the base of this fold the neighbouring parts of the theca have fused, and the septa of each side of the fold have united round its margin. Close to the beginning of the fold at the lower surface a small calicle is visible, probably a part of the upper surface that was bent down by the folding of the margin and afterwards more or less cut off. One of the specimens of *F. hexagonalis* described above shows a similar false bud, but in this specimen of *F. marginata* there is less positive evidence that the bud has developed in this way. It may also have arisen as a true lateral bud, developed from the living tissues of the lower surface. The septa of the bud-like young corallum are radially arranged round the mouth, six of them are more prominent than the others, though the cyclic arrangement of all the septa is not clearly visible as yet. The bud is attached with a broad base to the lower surface of the mother-corallum.

Probably owing to the compact structure of the corallum there are only a few broken and afterwards regenerated specimens in the collection. One specimen (fig. 22) shows the first stages of regeneration of one half of a broken corallum. The central parts are regenerated in a very regular way, completing the radial arrangement of the septa. The septa in the new part opposite to those of the lower cycles in the original half-corallum are stronger than

the others, constituting a result similar to the normal condition. In the marginal region of the same specimen, at the point where the corallum has broken, five buds have grown out, the soft parts of some of which are connected with those of the mother-corallum whilst around the others the soft parts of the corallum have vanished. A side view of this corallum shows that the theca is strongly developed, the difference in thickness between the theca of the regenerated part and that of the old corallum amounting to about 6 mm.

On another half corallum some 30 buds have developed. The living tissues of the mother-corallum have died and are overgrown with algae. No regeneration of the defunct disc has taken place in this specimen.

There are fifteen specimens in the collection in which the corallum had still its circular form and which had lost their living tissues except on some spots where buds had developed from the remainder of the soft parts, especially in the marginal portion. I obtained this large material by asking the diver to collect all the specimens he saw, also the dead ones and other at first sight less fine-looking specimens. As a matter of fact the size of the buds depends upon the time during which the decay of the living tissues has been going on. In the corals of which the living tissues had but recently died (this can be deduced at first sight from the unaltered appearance of their septa) the younger stages of budding are found (fig. 52). In these specimens there are occasionally buds in which the second cycle of septa is not yet complete (text-fig. 1). Younger buds with only six septa could not be detected. Buds that have two complete cycles and also older ones occur more frequently. As a rule the most developed buds are found on those coralla of which the living tissues disappeared long before (fig. 53). Wherever the soft parts have been wanting for a long time the corallum has a very worn-off appearance and is often overgrown with a great many foreign organisms (e. g. *Lithothamnion,* various other algae, *Polytrema,*

Fig 1. *Fungia marginata,* Young bud with the septa of the first cycle and the first traces of two septa of the second cycle × 90.

sponges, etc.). On these mother-coralla with strongly worn-oft surfaces buds are often found whose anthocaulus is provided with a ring indicating the place where a former anthocyathus has detached itself from it. A new anthocyathus is then usually developing itself above this ring. In the largest attached anthocyathus four complete cycles of septa have developed (fig. 54). It has a diameter of 5 mm but it is probable that normally the anthocyathi attain a larger size before becoming free. These larger anthocyathi have already a hexagonal shape. Another noticeable fact is that the buds of this species as compared with those of *F. hexagonalis,* which possess the same number of septa, have on the whole a much more solid appearance, the stalk also being much thicker.

In the specimen of the fig. 51 also some marginal buds have developed.

Some of the buds have abnormally developed in one direction and in these there are occasionally two mouths. Macroscopically it is not easy to determine whether these abnormities are the result of fission of one polyp into two halves or the result of coalescence of two buds that have originated beside each other. A microscopical series of one of these enlarged buds shows two separated stomodaea, each of which has two pairs of directive mesenteries. Now Duerden (1902) has shown that the cardinal difference between fission and budding is found in the directive mesenteries: in cases of budding the new individual develops two pairs of new directives, whilst in processes of fission in all the polyps of the colony there are only two pairs of directives, viz. those of the original coral-polyp. In the case described here therefore the abnormal bud cannot have got its enlarged form by fission but it must have developed from two buds that have united. It is also possible, but less probable, that the original bud divided into halves by budding and that afterwards these secondary buds had coalesced, by which process the occurrence of the double sets of directives may be also explained.

Fungia distorta Michelin.

(Pl. VI. figs. 55—64).

Fungia distorta Döderlein 1902.

Localities[1] : D. Exp. t. Kei Isl.: (Bay of Amboina, 70—100 m, 3 fragments); Moea noejanat (the small island to the south coast of Doeroa), reef, 157 ex. and a great number of fragments; Stat. 19, 20 m, 3 frgm.; Banda, ca. 9 m, 91 ex. and a great number of fragments.

Dr. Mortensen's Pacific Exp.: Off Jolo, Sulu Islands, ca. 27 m, 2 fragments.

In my material only the *Diaseris*-form of this species is represented. As I already pointed out in a former paper (1923 c) the costae of my specimens are on the whole less prominent than in the specimens figured by Döderlein.

All stages of regeneration are found among the material. Many specimens consist chiefly of a wedge-shaped fragment on the central part of which the first traces of new sectors are visible (fig. 64). This new-formed part enlarges itself in the course of development and usually differentiates into two or more separate lobes in each of which the peripherical parts of the septa diverge more or less. At last the corallum is composed of some almost equal lobes separated by deep furrows. Usually the parts composing the corallum seem to detach themselves from each other when the corallum has reached a certain size and afterwards each piece regenerates into a new *Diaseris*-form. Sometimes only one of three wedge-shaped fragments is separated from the others and traces of a new fragment can be seen in its place.

The septa in each part of the corallum bend more or less towards the sides of the lobes; in some specimens they have a strongly curved course (fig. 56).

In some of the larger specimens, especially in those from Banda, the furrows that separate the different wedge-shaped components of the corallum have almost completely fused, the corallum in general also being comparatively thick (figs. 59, 60). The shape has become nearly circular, only a few notches in the marginal region and a few ridges at the lower surface indicate the original sectors of the *Diaseris*-form. There is much evidence that these

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1) cf. foot-note on p. 192.

corals will remain circular and these specimens then present a case of transition of a *Diaseris*-into a *Cycloseris*-form.

Sometimes, when the mouth has lost its living tissue (e. g. caused by a parasite) some smaller septa are formed in the region nearest to the old mouth, constituting a ridge that separates the dead portion from the living one (fig. 55). A new mouth then arises between the new septa and the old ones and afterwards the new septa may grow out further and cover the old dead mouth. In some cases this process leads to an abnormal protrusion over a part of the corallum by means of which it looks like a double corallum (fig. 61). In this specimen the original mouth has altogether vanished as it is wholly overgrown by the new-formed portion, and two new secondary mouths have developed.

In the specimen of fig. 62 the two parts that are growing out from the central part of a large fragment are of an unusual shape. Between them a kind of ridge is visible and the septa of each lobe are arranged more or less at right angles with this ridge. In each of the smaller lobes a new mouth is formed.

In some specimens the old mouth has undergone fission by means of a septum that has enlarged itself and that divides the mouth into two halves (fig. 58). Afterwards small new septa can be formed in the region that separates the two mouths, so that they come to be situated at a short distance from each other (fig. 63).

Some of the specimens of Stat. 19 are much thinner than usual and they therefore remind us in some respects of *F. fragilis*. This likeness, however, is but very superficial: all other characteristics are as many indications that the specimens belong to *F. distorta*.

Fungia somervillei Gardiner 1909.

(Pl. VI, fig. 65).

Locality: Dr. Mortensen's Pacific Exp.: Off Jolo, Sulu Islands, ca. 45 m, 1 ex.

The specimen (fig. 65) has the following dimensions: length 95 mm, breadth 77 mm, height 22 mm. It is about 5 mm thick at its margin by 17 mm in the centre. The septa are comparatively thin, the costae very fine and low, they extend as in the type-

specimen (cf. Gardiner, 1909, Pl. 34, fig. 6) into wavy lines over the original scar of attachment. The columella consists of small, rounded papillae. In all other respects the specimen also closely resembles the type-specimen.

I have compared this specimen with the one described by van der Horst (1921, Pl. I, fig. 2) under this name. This latter specimen is more elongate, the septa are thicker and the chief costae more prominent. The columella is less regularly built than in the type-specimen. On account of these peculiarities the specimen of the Siboga Expedition presents a rather different form.

Fungia vaughani Boschma 1923c.

(Pl. V, fig. 20).

Localities: Dr. Mortensen's Pacific Exp.: Hilo, Hawaii, 3 ex.; Honolulu, 18—72 m, 2 ex.

In a former paper (1923c) I have given the measurements of the specimens in the collection.

The smallest specimen is preserved in alcohol, the four other ones are dry. In the specimen with 56.5 mm greater diameter the outline of the scar of detachment is still visible. The septa are arranged in very regular cycles, the septa of each higher cycle being distinctly shorter than those of the next lower one. This regularity manifests itself also in the arrangement of the tentacles as is shown by the specimen preserved in spirits. Here the tentacles of the different cycles are arranged in concentric rows (fig. 20).

Fungia cyclolites Lam.

(Pl. V, fig. 24, Pl. VI, figs. 25—48).

Fungia cyclolites Döderlein 1902.

Localities: Cycloseris-specimens: D. Exp. t. Kei Isl.: Bay of Amboina, 0—4 m, 129 ex. and 43 anthoblasts; Bay of Saparoea, 30—70 m, 1 ex.; Banda, 20—25 m, 12 ex.

Trincomalee, Ceylon, Fristedt leg. 1889, 1 ex.

Diaseris-specimens: D. Exp. t. Kei Isl.: Bay of Amboina, 12—18 m, 2 ex. and 10 fragments of other specimens, (50—100 m, 3 frgm.)

All *Cycloseris*-specimens from Amboina were collected near Gelala, where a small river debouches into the Bay and has formed

a bank of stones and sand in the sea. Here I collected a great number of anthoblasts and free anthocyathi in all sizes, many of which were regenerated from fragments. *Fungia cyclolites* was the only species of the genus that occurred here, so that the anthoblasts cannot have belonged to another species, and moreover all intermediate stages between stalked young specimens and adult ones were collected. Besides these a great many specimens were procured by a native diver, also in the neighbourhood of Gelala, from depths of 1 to 4 meters.

The material of this species from Amboina, though it was collected in a very limited locality, is comparatively variable in form. Especially the height is different in specimens possessing the same length, as may be seen in the following table, where the measurements are given of pairs of coralla that have about the same length.

Greater diameter mm	Lesser diameter mm	Height mm	Greater diameter mm	Lesser diameter mm	Height mm
19	18.5	5	44	40	13.5
19	18	8	45	40.5	21
37	34.5	11.5	56 5	49	19
38	34.5	14	57.5	55	28
41	35	13	62	52.5	21.5
40	36	16	63	51.5	34
45	38	15	67	61	24
45	40	22	67	59	30

In many specimens the whole of the upper surface is strongly arched, whilst in other ones only the central part of the corallum is arched and the marginal part is much less elevated (fig. 48). Sometimes the margin presents a sharp edge, especially in the younger specimens. In most cases, however, the margin of the corallum is broadly rounded and the septa continue gradually into the costae. In the smallest specimens the six primary septa are easily recognisable. Their size is larger than that of the others and they extend further towards the axial fossa. In the course of further growth the septa of the second cycle on both sides of the axial

fossa become as large as those of the first cycle. Afterwards also the septa of the third cycle develop more strongly. The dorsal and ventral septum of the first cycle remain much smaller than the other ones. The final result is a corallum that possesses a row of strongly prominent septa belonging to the first, second, and third cycles at each side of the axial groove, whilst in the parts along the greater axis the septa are much less conspicuous. The central part of the septa of the higher cycles with which two septa of a next higher cycle have fused are very thin and but slightly lower than the septa of the lower cycles. In the younger specimens the costae extend in regular lines from the centre to the periphery; in older specimens the costae may assume a more or less winding course, whilst in the centre of the lower surface irregular figures may arise by the fusion of parts of neighbouring costae.

The anthoblasts of this species (figs. 39 and 47) are always solitary, in most cases their stalk does not attain a greater height than 3 mm. In the smallest specimen found (diameter of the disc 4.5×4 mm) four complete cycles of septa have developed. Those of the first cycle are free, the septa of the third cycle are fused with the secondaries, the quaternaries with the tertiaries. The disc is slightly oblong, not hexagonal. The fifth cycle of septa appears when the dimensions of the disc amount to about 7.5×7 mm. In the largest anthoblast the dimensions of the disc are 11×10 mm. In this anthoblast five complete cycles of septa are present and some members of the sixth cycle. Usually the anthocyathi come free before this size is reached for I found many free anthocyathi of much smaller size between the stalked individuals. The scar of detachment is soon covered by living tissue and the sharp outline of it vanishes in most cases very shortly after the anthocyathi have become free. This is already visible to a certain degree in the smallest anthocyathus found free, whose larger diameter is 6 mm. But in other specimens the scar remains much longer visible, even in some specimens exceeding 20 mm in length a definite scar is still to be seen.

On several anthocauli from which an anthocyathus has detached itself a new disc is developing. A ring-shaped wall (Semper's Wachsthumsring) a little beneath this new disc indicates where the former anthocyathus has loosened itself from the stalk.

Although the corallum of *Fungia cyclolites* is very thick, yet a great many broken specimens that were regenerating could be collected. The regeneration of the broken specimens which were found in the same locality as the normal ones always tends to restore the original circular shape of the corallum (figs. 25—38). Everywhere on the line of fracture new parts are developing which form a continuous zone of growth and do not differentiate into lobes as in *Diaseris*. The outcome is always a circular corallum whose septa and costae present some irregularities, but on the whole these are of little importance.

As a result of the regeneration often new mouths originate at the upper surface of the corallum (fig. 33). From these mouths the septa more or less regularly radiate towards the periphery of the corallum.

Secondary mouths are also sometimes found in specimens that in other respects appear to be quite normal. One specimen with a normal lower surface has three secondary mouths at the upper surface. Between the largest of these and the primary mouth the septa belonging to each of them are elevated and have grown together, whilst a kind of wall has developed at the boundary-line of the two sets of septa.

Besides specimens in which budding has taken place there are also some specimens showing phenomena of fission. In the specimen represented in fig. 46 the original mouth has divided into almost equal parts by the fusion of some opposite septa in the short axis of the corallum. This specimen presents no further irregularities. In some cases, however, the fission of the mouth is the result of the decay of a portion of the central part of the corallum. Then some of the septa may loose their living tissue for the greater part of their extent. The neighbouring parts then grow out radially around new secondary mouths over this dead portion. By this process some of the septa of the new portion are at right angles with the original ones. Fig. 45 shows another case of regeneration of the corallum over a portion that had died off. Originally the regeneration had begun in two different places; at last the two resulting new parts fused at the line where they met. In other specimens the further stages of this kind of regeneration are found, especially when it began when the corallum was still extremely

small. In these cases also often some irregularities have developed at the upper surface: the mouth may divide itself and a number of secondary calicles surrounded by more or less radially arranged smaller septa often develop in the regenerated portions.

In the above described specimens the secondary mouths are usually surrounded by septa that are more or less arranged in a radial manner. A much more common phenomenon in *F. cyclolites* is the occurrence of smaller secondary calicles between two larger septa (fig. 48). The mouths of these secondary calicles are but partly surrounded by new septa, the greater part consists of the septa of the mother-corallum. In the central part of the bud the septa of the mother-corallum have partly been resorbed, and in the axial groove, that has developed by this process, a few papillae of the columella are often visible. The arrangement of the septa in these secondary calicles shows some likeness with that in the secondary calicles of *Herpolitha*.

Among the larger specimens from Banda there are a few which show a close resemblance to the specimen that was described by Döderlein as a variety of *Fungia elegans* (1902, p. 80 and Taf. IV, figs. 3 and 3a). These specimens are nearly circular, the lower surface is concave, the marginal parts are comparatively thin, and the central part of the upper surface is much elevated. In side view (fig. 24) the free edge of the septa shows a distinct concavity. The axial fossa is when compared with typical specimens of *F. cyclolites*, very short. Between these specimens and those of the usual form there are in my material all intermediate stages. According to Döderlein the specimen described by him constitutes an intermediate stage between *F. elegans* and *F. cyclolites*. The specimens in my material also remind us in some respects of *F. elegans*, but there is no doubt as to their identification with *F. cyclolites*. One of these specimens shows a slight difference in the structure of the costae: these are covered with somewhat smaller spines than is usually the case in *F. cyclolites*.

Some specimens of a *Diaseris*-form were dredged at a depth of 12—18 m. Most of these have separated themselves into the composing wedge-shaped fragments (figs. 40—44), only some of them are more or less complete. They represent the *Diaseris*-form of *Fungia cyclolites*, which results from a comparison of these

specimens with *Cycloseris*-forms of this species that have the same size. The septa and costae in each lobe (or fragment) diverge from the central septum and especially their marginal part is strongly curved. These specimens differ from all other *Diaseris*-forms by the height of those septa with which two neighbouring septa of the next higher cycle have fused. This characteristic is also found in the *Cycloseris*-form of *F. cyclolites.*

There is much evidence that the description of *Diaseris Mortoni* by Tenison-Woods (1881) was based on specimens closely resembling the *Diaseris* from Amboina. This author already suggested that *Diaseris Mortoni* represents incomplete forms of *Fungia cyclolites.* Döderlein (1902) also regards *Diaseris Mortoni* as a form of the species *Fungia cyclolites.* The specimens in my material moreover agree in every respect with the original description and figures of *D. Mortoni.*

Fungia actiniformis Q. & G.

Fungia actiniformis Döderlein 1902.

Localities: D. Exp. t. Kei Isl.: Doeroa, reef, 4 ex.; off Toeal, ca. 1 m, 1 ex.; Banda, 10—30 m, 2 ex.

This species is a very common one in the Kei Islands, though but a few specimens were collected.

Fungia moluccensis van der Horst 1919, 1921.

(Pl. VI, fig. 49, Pl. VII, figs. 75, 76 and Pl. X, fig. 128).

Localities: D. Exp. t. Kei Isl.: Banda, 0—2 m, 12 ex.

The two specimens on which van der Horst's description of *Fungia moluccensis* was based differ in the nature of the lower surface. In the case of one of them, the type-specimen, (van der Horst 1921, Pl. II, figs. 1, 2) the chief costae rise considerably above the others and they are much more densely granulated, whereas in the other specimen all costae have nearly the same prominence. In my specimens the chief costae are as a rule easily to be distinguished at first sight from the other ones, having more rows of spines or granulations, but in some of them the costae show hardly any difference. In one specimen the costae are only

visible in the marginal part, the central part of the lower surface of this corallum is only densely granulated (fig. 128). The central part of the oral surface of all specimens is markedly elevated round the axial fossa, the marginal part is much flatter. The septal edges are minutely dentated and granulated and the central parts of the chief septa are usually considerably thickened. Sometimes all septa are perforated, in other cases those of the lower cycles are solid; but on the whole the shape of the septa varies much in different specimens. The columella consists of a spongy mass of irregularly fused trabecula.

Measurements of some comparatively regular specimens in mm:

Greater diameter	Lesser diameter	Height	Thickness round axial fossa
168	110	80	30
132	92	69	34
121	83	45	27
110	73	39	33
87	42	30	26

As for its place among the other Fungiae this species seems to be allied to *F. paumotensis.* In this latter species there are some aberrant forms which present peculiarities as are found normally in *F. moluccensis* (cf. the description of these specimens in the following pages under *F. paumotensis*). On the other hand *F. moluccensis* has some resemblance to the specimens of *F. cyclolites* in which the thickened central part projects above the comparatively flat margin. Intermediate stages between *F. cyclolites* and *F. moluccensis* are found in the two species *Fungia sibogae* van der Horst and *Fungia adrianae* van der Horst. *F. adrianae* is characterized by its larger size and its strongly meandering costae, in all other respects it closely resembles *F. cyclolites.* On the contrary *F. sibogae* seems to be nearer allied to *F. moluccensis.* In *F. sibogae* the costae are provided only with very small spines, whilst in *F. moluccensis* the costal spines are usually well-developed. The upper surface of both forms is very similar, only the granulation of the septa is in most specimens of *F. moluccensis* more conspicuous than in *F. sibogae,*

in which the septa have a slightly more solid structure. Excepting these differences the type-specimen of *F. sibogae* in every respect closely agrees with the specimens of *F. moluccensis* from the Leyden Museum and those of my material. In my opinion *F. sibogae* may hardly constitute a definite species, in all probability it is an aberrant form of *F. moluccensis*, perhaps a local variety. This latter species is very variable: the specimens in my material also show considerable differences in the size and number of the costal spines.

One specimen in my collection (fig. 49) which very probably belongs to *F. moluccensis,* also has some likeness to certain specimens of *F. cyclolites.* The structure of its upper surface closely resembles that of *F. cyclolites,* the lower surface is quite similar to that of some specimens of *F. moluccensis:* the chief costae are beset with numerous irregular spines. This specimen shows some abnormalities owing to the fact that the living tissue of the mouth and the neighbouring parts had been destroyed. At the central part of the upper surface next to the old axial fossa a number of small secondary mouths have developed. Between some of these and the old axial fossa a kind of ridge has been formed on which the new-formed septa belonging to the secondary mouths have arisen. In the central part of the lower surface of this specimen also the living tissues had vanished, which stimulated the neighbouring parts to augmented growth and this has resulted in the formation of a stalked bud of somewhat irregular shape (fig. 49).

In *F. moluccensis* at the central elevation of the upper surface of the corallum often secondary calicles are formed. In fig. 75 some young stages of these secondary mouths are represented. Only a few septa are interrupted at the place where the new mouth has developed and the parts of these septa nearest to the secondary mouth have grown out in a radial direction towards the centre of the little calicle. Also new septa have been formed as excrescences from the uninterrupted septa nearest to the young mouth. The axial fossa of this specimen shows no irregularities. Fig. 76 shows a further stage of formation of secondary calicles. On every side of the central elevation of the oral surface there are a large number of secondary calicles (on the whole about 38). The old septa of the mother-corallum are often divided into three or more parts. Here the secondary mouths are much larger than in the

former specimen, and the septa are arranged around them in quite the same manner as in *Halomitra*. The axial fossa of the mother-corallum has also lost its usual form; it has divided itself into six parts, some of the septa on either side of the corallum having fused across it. Four of the six secondary mouths that are derived directly from the original axial fossa, though being easily recognisable, are but little larger than the secondary mouths that have arisen between the septa of the mother-corallum. In this specimen the occurrence of the secondary mouths can still be explained as an abnormally developed condition of a formerly simple *Fungia*. If the development of secondary calicles had gone farther so as to divide the old axial fossa into even more parts, the specimen could not have been recognized as a *Fungia* and would have to be classified among *Halomitra*. The way of transition of *Fungia* into a form greatly reminding of *Halomitra* is in this special case a very irregular one. In the young stages of *Halomitra* the central calicle is much less elongated and does not divide itself into smaller ones. The new calicles develop by budding between the central calicle and the margin of the corallum. It is a very remarkable fact that in this specimen of *Fungia moluccensis* by the united action of fission and budding a compound corallum has been formed, in which the distribution of the calicles over the oral surface strongly resembles that found in *Halomitra*, whilst in this latter genus all calicles develop by budding.

There is one more specimen in the collection in which the derivatives of the former axial fossa and the secondary calicles, formed at the sides of the elevated central portion of the corallum, are all approximately of the same size. This specimen, however, bears on the whole less resemblance to *Halomitra* than that of fig. 76. Around each of the secondary mouths the septa are clearly arranged in a radial manner and the calicles are larger than in the specimen described above. In another specimen there are two mouths of about equal size, separated by somewhat irregular small septa. Probably the two mouths are the result of fission of the old axial fossa into two halves.

One small specimen consists of two individuals fused with the central part of their aboral surface. On one side of the compound corallum the septa belonging to one individual pass gradually into

those of the other. As the scar of previous attachment to the anthocaulus has altogether vanished it cannot be decided whether one of the two components has budded off from the other or if the compound corallum is the result of fusion of two neighbouring buds of an anthocormus. The septa of this compound specimen have long dentations which often fuse together thus forming highly porous lamellae.

A large scar of detachment is still visible in another small specimen, but in the other coralla of this species it is indistinct or has wholly vanished.

Fungia paumotensis Stutchbury.

(Pl. VII, fig. 77).

Fungia paumotensis Döderlein 1902.

Localities: D. Exp. t. Kei Isl: Amboina, 0—2 m, 1 ex.; Off Toeal, 0—2 m, 1 ex.; Oeboer, reef, 3 ex.; Doelah laut, reef, 11 ex.; Banda, 0—14 m, 11 ex.

The aboral surface of all specimens in the collection has more or less blunt spines of very variable size: in some specimens they are very thick, in others much smaller. The costae may be lamellar at their base or consisting only of isolated spines in definite rows. One specimen differs from all others by its chief costae having broadened spines which are often ramified at the apex (fig. 77). In the central part of the lower surface of this corallum there are the rounded spines of the usual form. The lower surface of this specimen therefore shows some resemblance with specimens of *F. moluccensis.*

The oral surface in most specimens shows no differences with the typical form, usually the septa are straight, with only small dentations. In one specimen, however, the septa are strongly meandering, but in other respects this specimen resembles closely the other specimens of *F. paumotensis* in my material. The absence of every trace of a tentacular lobe proves that this specimen belongs to *F. paumotensis.*

Very often a few secondary mouths arise at the upper surface. When this phenomenon is very prominent the corallum assumes a

quite abnormal appearance, as one specimen in my material, in which there are some 30 of these secondary mouths.

One specimen in the collection recalls in some way strongly *F. moluccensis*. The structure of its costae, which consist of single rows of blunt spines is exactly the same as in other specimens of *F. paumotensis*. The lower surface, however, is quite flat and the upper surface answers in nearly all respects to *F. moluccensis*. The septa have minute dentations. The central parts of the septa of the higher cycles with which two septa of the next higher cycle have fused are strongly granulated and appear therefore much broader, whilst in *F. paumotensis* these parts of the septa usually retain the same thickness as the peripheral part. The central region round the axial fossa shows the typical elevation of *F. moluccensis*, but less prominently than in the other specimens of *F. moluccensis* in my material.

Fungia scutaria Lamarck.

Fungia scutaria Döderlein 1902.

Locality: D. Exp. t. Kei Isl.: Banda, 14 m, 1 ex.

The comparatively small specimen has well-developed tentacular lobes which clearly project above the neighbouring septa. The septa are thin. The dimensions of the corallum are: length 73, breadth 50, and height 18 mm.

Fungia echinata (Pallas).

(Pl. VII, figs. 66, 67, 71, 72, Pl. X, fig. 126).

Fungia echinata Döderlein 1902.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 6 ex.; Banda 0—20 m, 5 ex.

The lower surface of all specimens in the collection is provided with strong spines (fig. 67), which is one of the chief characteristics separating this species from *Herpolitha simplex* (cf. below).

The youngest specimen in my material is a stalked anthoblast (figs. 71 and 72), the dimensions of which are: length 26, breadth 20 and height 6 mm. There are five complete cycles of septa

whilst in the neighbourhood of the anterior and the posterior septum of the first cycle some of the septa of several higher cycles have been formed.

A great deal of the specimens in my material have regenerated from a smaller or larger fragment and present therefore some irregularities. When regenerating the corallum at first may assume a quite abnormal shape, but in the course of further growth it develops again into the usual oblong form.

A part of the upper surface of one specimen has lost its soft tissues and also at the lower surface the living parts corresponding with it had begun to decay. At the border of the living part nearest to the defunct portion a bud has developed (fig. 126), which is attached with a broad base to the lower surface of the corallum. It is easy to see that the septa of this lateral bud have arisen by flattening of the costal spines of the mother-corallum.

One specimen is four-rayed, the axial fossa forms a cross at the upper surface. It is divided into some secondary calicles by the fusion of pairs of septa across it.

Fungia granulosa Klunzinger.

Fungia granulosa Döderlein 1902.

Fungia granulosa van der Horst 1921.

Locality: D. Exp. t. Kei Isl.: Banda, 0—14 m, 8 ex.

The measurements of the specimens in my collection are given in mm in the following table:

Greater diameter	Lesser diameter	Height
38	36	7.5
47.5	45	11
51.5	51	12.5
57.5	57	14
64	61	14
65	69	20.5
84	84	26
98	99	25

In the smallest specimens the granules of the lower surface are very inconspicuous, almost microscopical, and the costae of the lower cycles are hardly stronger developed than those of the higher cycles. In the larger specimens the costae of the lower cycles become more prominent and appear broader on account of several irregular rows of granules and small spines.

The central part of the oral surface of the two largest specimens in the collection is slightly elevated, the lower surface and the marginal part of the upper surface are almost quite flat. To a certain extent therefore the general appearance of these specimens differs from those described by Döderlein. Also in the specimen from the Leiden Museum (cf. Van der Horst 1921, p. 11) the lower surface is almcst flat, whilst the upper surface is evenly convex.

One specimen has two mouths, separated by a zone with short irregular septa, probably the result of fission of the original mouth into two halves.

Fungia concinna Verrill.

Fungia plana Döderlein 1902.
Fungia concinna Döderlein 1902.
Fungia concinna van der Horst 1921.

Localities: D. Exp. t. Kei Isl.: Doelah laut, reef, 7 ex.; Oeboer, reef, 1 ex.; Banda, 0—2 m, 17 ex.

Besides the specimens of *F. granulosa* already dealt with there are in my material 47 specimens of Döderlein's *repanda*-group. Many of these are typical representatives of *F. concinna* and *F. repanda* as these are defined by Döderlein, some other specimens can easily be identified with *F. plana* Studer, but a large number of specimens do not fit in exactly with one of Döderlein's species. *F. scabra* Döderlein is not represented in my material.

Among the specimens in my material there are a few in which the wall is strongly perforated and which therefore have to be classified with *F. repanda*, although in general appearance and in the structure of their septa and costae they are much more like *F. concinna*. In a very limited area on the reef of Lontor (Banda) I collected 25 specimens showing phenomena of regeneration, 16 of which are strongly perforated and 9 more or less solid. A remarkable fact is that the regenerated younger parts in *F.*

concinna have a considerably more perforated wall than the original part of the corallum from which they have grown out.

The specimens answering to the diagnosis of *F. plana*, as given by Döderlein, are connected with *F. concinna* by a gradual series of specimens with septal dentations and costal spines of various size. I have united as *F. concinna* all specimens with a solid wall and those in which only a few perforations are to be seen in the marginal part of the disc, whilst the specimens with a clearly perforated theca are recorded under *F. repanda.* I admit that, in doing so, the distinction between these two species is somewhat arbitrary, and perhaps the three species *F. plana*, *F. concinna* and *F. repanda* had better be united under this latter name, but for the present I retain the two species, from each of which I have some representatives showing the characteristics as given by Döderlein.

In the literature there are some remarks on the difficulties in distinguishing these three species of the *repanda*-group. As for the perforations of the theca, after Vaughan (1907) „*F. plana*, *F. concinna* and *F. repanda* form a closely related, or even a continuous series, with a passage of a solid wall to one that is abundantly perforate." (p. 126). The occurrence of a number of intermediate forms induced Gardiner (1909) to unite *F. plana* and *F. concinna* as one species *F. concinna*, from which *F. repanda* remains separated as a distinct species. In a later paper (1918) Vaughan places *F. plana* in the synonymy of *F. concinna.* Van der Horst (1921) also distinguishes only the two species *F. concinna* and *F. repanda* in the same way as Gardiner and Vaughan. Among the material of the Siboga Expedition there are a number of flat specimens from Stat. 315 with a slightly elevated central part of the upper surface belonging to *F. concinna.* The septa and costae of these specimens have exactly the same structure. In some of them the theca is strongly perforated, so that only a small central part has a solid wall, whilst in other specimens the theca is altogether imperforate (cf. also Van der Horst 1921).

The greater part of the nine regenerating specimens from the reef of Lontor presents no peculiarities of special interest, the process of regeneration takes place in quite the same way as in *F. repanda* (cf. fig. 74). One specimen has become nearly circular

again, but there remain still some irregularities in the course of the septa and costae of the new-formed part.

In another specimen a bud of very regular structure has grown out on the lower surface. It is attached with a broad base to the centre of the lower surface. The centre of the upper surface of this specimen shows an irregular protuberance which is surrounded by some secondary mouths. These irregularities are often found in the larger species of *Fungia*. They sometimes are caused by a crab, which lodges in a hole at the base of the excrescence.

Fungia repanda Dana.

(Pl. VII, fig. 74)

Fungia repanda Döderlein 1902.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 4 ex.; Banda, 0—2 m, 18 ex.

Some of the specimens in my material bear a strong resemblance to *F. concinna,* but on account of their having a strongly perforated theca these are placed here among *F. repanda.*

A great deal of the material (16 specimens from the reef of Lontor in the Banda Islands) consists of formerly broken specimens which were in different stages of regeneration. When this process is still in an early stage semicircular protuberances are visible in several places in the region of fracture round the formerly damaged mouth or round secondary mouths between the old mouth and the peripherical parts (fig. 74). In further growth the sides of the different semicircular parts fuse and all septa of the regenerating portion become more radially arranged in regard to the centre of the corallum. In this species, as in all other large species of *Fungia*, the regeneration of a broken corallum always leads to a form similar to the original one, *Diaseris*-like lobes are not formed. As the regenerated portion is much thinner than the original fragment at the lower surface an indication of former regeneration always remains as a sharp ridge at the margin of the two portions. Even in coralla that already have become circular again such a ridge is clearly visible.

In one specimen about half of the corallum had lost its living tissues. At the lower surface four buds have grown out at the margin of the dead part. The septa of these buds have developed

from flattened costal spines; in most of the buds the mouth is as yet but partly surrounded by septa. Only one of the buds has a more or less complete set of septa.

Fungia horrida Dana.

Fungia horrida Döderlein 1902.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 1 ex.; off Toeal, 0—2 m, 2 ex.; Banda, 0—2 m, 1 ex.

With some doubt I refer to *F. horrida* four of my specimens which belong to Döderlein's *danai*-group. They have a solid theca (except a few perforations in the marginal part), comparatively large septal dentations, which vary in size in each specimen, whilst the chief septa are noticeably thicker than the others. The size and arrangement of the costal spines are somewhat different in the four specimens. The greater diameter of the discs is 252, 195, 126 and 77 mm. Two of them therefore are larger than the hitherto known specimens of *F. horrida.*

Fungia danai M.-E. & H.

Fungia danai Döderlein 1902.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 1 ex.; Banda 0—2 m, 2 ex.

The greater diameter of the two specimens from Banda is 112 and 119 mm, both of them have well-developed tentacular lobes. The specimen from Amboina is a stalked anthoblast (greater diameter 45, lesser diameter 41 mm), attached to a dead piece of corallum. The shape of its septal dentations has some likeness to those in *F. scruposa*, the lower surface of the anthoblast, however, shows more resemblance to the specimens of *F. danai* figured by Döderlein than to those of *F. scruposa.*

Fungia fungites (L.)

(Plate VII, fig. 73)

Fungia fungites Döderlein 1902.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 9 ex.; Doelah laut, reef, 5 ex.; Banda, 0—2 m, 5 ex.

Dr. Mortensen's Pacific Exp.: S. Crux Island, Zamboanga, Philippines, reef, 1 ex.

North of Koh Kahdat, Siam, 0—2 m, 1 ex. Dr. Mortensen leg. 1900.

Among the specimens collected during the Danish Expedition to the Kei Islands there are several that answer to one of Döderlein's varieties of this species, whilst it is only with great uncertainty that the others can be classed with one of them. As moreover in one locality more of these varieties often occur together it is of no use to give further details about the distribution of these varieties.

In many specimens of the collection secondary mouths have developed on the oral surface of the corallum; in one specimen there are even more than forty of these (fig. 73). The first stages of formation of these secondary calicles consist only of a deep notch in two or three neighbouring septa. Afterwards the parts of these septa nearest to the mouth of the secondary calicle grow out radially towards the centre of the mouth and new septa are formed as excrescences on the septa of the mother-corallum nearest to those that have a notch. In the further stages of development the septa or parts of septa that belong to the secondary calicle become more and more radially arranged around its mouth. In this way some of these coralla with a great many secondary calicles acquire some resemblance with *Halomitra*, in which genus the secondary calicles develop in the same way.

There is very little doubt that *Halomitra fungites* Studer (cf. Studer 1901) also is a *Fungia* in which a large number of secondary calicles have developed. The axial fossa of the largest calicle in Studer's specimen is quite different from that of the central calicle in *Halomitra*. Gardiner (1909) already expressed his doubts as to the classification of this form among *Halomitra*. Probably Studer's specimen belongs to *Fungia fungites* as the description of its costal spines seems to indicate.

In some specimens buds have developed at the lower surface, usually in the neighbourhood of a part of the corallum from which the living tissues had vanished. Other specimens show phenomena of fission, and others again have regenerated from a small part of a broken corallum. In a former paper (1923b) I have described at length these phenomena in a large material of *Fungia fungites*. The specimens in the present material do not afford particulars greatly differing from those described in my former paper.

Herpolitha Eschscholz.

The genus *Herpolitha* was founded by Eschscholz (1825) for the colonial elongated Fungids (Lamarck's *Fungia limacina* and *talpina).* Afterwards (1849) Milne Edwards and Haime created a new genus, *Cryptabacia*, the type-species of which was *Fungia talpina* Lamarck. The species *Herpolitha limacina* was formerly described by Esper (1797) as *Madrepora limax* and has therefore to keep the name *Herpolitha limax* (Esper).

Most of the species of Ehrenberg's genus *Haliglossa* are representatives of the genus *Herpolitha,* viz. *H. interrupta*, *limacina*, *foliosa* and *stellaris.* Two new species of the genus *(Herpetolithus strictus* and *crassus)* were described by Dana (1846). Now all these described species of Herpolitha differ in minute details of structure which are moreover subject to strong variation. In some specimens the septa are crowded, in others more distant. The thickness of the septa, the size of the septal dentations and costal spines, the width and depth of the central fossa are characteristics used to distinguish the different forms of *Herpolitha* as definite species. In *H. crassa* the secondary calicles on the side of the disc are as a rule more distinct and have more clearly radiating septa than those of *H. limax.* In my opinion this is a result of the fact that the specimens referred to *H. crassa* in most cases are the older, thicker ones, and in these specimens the calicles next to those of the central fossa indeed are very regularly built. But in the marginal part of the same specimens the calicles show no difference at all with those of *H. limax.* The differences in thickness etc. are also found in many species of *Fungia*, but these are very variable characteristics, usually due to external influences. Moreover there are intermediate specimens between the different forms as also Van der Horst has remarked. On account of the reasons given above I place all the before-mentioned species of *Herpolitha* in the synonymy of *H. limax*, as this has been done before by Milne-Edwards and Haime (1851), Ortmann (1888) and Van der Horst (1921).

The two species *Herpolitha (Fungia) simplex* Gardiner and *Fungia weberi* van der Horst are in the adult stage only known as colonial forms and they have therefore to be removed from the

genus *Fungia*. They represent more or less intermediate forms between the species of the genus *Fungia* and *Herpolitha limax*. From this latter species they differ in having no secondary calicles on the lateral parts of the disc[1]). The two species have to be classified in the genus *Herpolitha* on account of the division of their fossa into secondary calicles.

In many species of *Fungia* the axial furrow is sometimes divided into separate secondary calicles, but these specimens are only abnormal forms of a species in which as a rule there is only one mouth. The two species dealt with below are, besides some young specimens of *H. simplex*, only known in the colonial form. They differ in constant characteristics from the species of *Fungia* and also from *Herpolitha limax*.

Herpolitha simplex Gardiner.

(Plate VII, figs. 68—70).

Herpolitha simplex Gardiner 1905.
Fungia simplex Gardiner 1909.
Herpolitha simplex Folkeson 1919.
Fungia echinata var. *parvispina* van der Horst 1921.

Locality: D. Exp. t. Kei Isl.: Banda, 0—14 m, 8 ex.

Among my material there are eight specimens which I first thought to be representatives of *Fungia echinata*, but which differ from this species by their having much smaller costal spines (fig. 69). Excepting the three youngest specimens these coralla with minute spines all have the axial fossa divided into secondary calicles by the fusion of opposite pairs of septa. In *Fungia echinata* this division of the original mouth into two or more parts is also often found, especially in larger specimens, but in these specimens with a quite different structure of the lower surface the colonial form seems to be constant in the adult stage. As in *F. echinata* there are a large number of prominent septa which alternate with one or more septa of lesser height. These less prominent septa are in *F. echinata* as a rule very thin, whilst in the eight specimens from Banda they are strongly granulated and appear therefore much thicker.

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[1]) In *Herpolitha weberi* the very first traces of the formation of secondary calicles on the lateral parts of the disc are visible (cp. below).

The above mentioned characteristics (small costal spines, axial fossa divided into parts and stronger granulation of the smaller septa) seem to be constant peculiarities by which the specimens are to be separated from *F. echinata.* According to the fact that all the adult specimens are colonial forms in which the original axial fossa is divided into secondary calicles these specimens have to be classified with the genus *Herpolitha.*

In the species *Fungia echinata* a number of previously described so-called species have been united (cf. Döderlein 1902, p. 101, 102). Firstly I compared the original diagnoses of these „species“ with my specimens with small costal spines, but none of these agree exactly with the specimens in my material. In the descriptions of two of these forms, viz. *Herpetolitha Ehrenbergii* Leuckart and *Fungia crassa* Dana, mention has been made of their colonial form. The costal spines of *H. Ehrenbergii* have approximately the same size as those in *Fungia echinata* (cf. Leuckart, 1841, Taf. II, fig. 3), and therefore my specimens cannot be identified with it. As for *Fungia crassa,* Dana states that the lower surface is crowdedly echinate and his figure (1846, Pl. 19, fig. 13) shows that the costal spines have about the same size as in *F. echinata.* Moreover I have photographs of the type-specimen of *Fungia crassa* in the United States National Museum which prove that the costal spines of this form are much larger than those of the colonial specimens in my material.

The species described by Gardiner (1905) as *Herpolitha simplex* and which afterwards (1909) was classified by this author among *Fungia* agrees in all essential characteristics with the specimens in my collection possessing small costal spines. I have examined the type-specimen of this species and I am fully convinced that the specimens in my material undoubtedly are representatives of Gardiner's species, which has to be replaced in the genus *Herpolitha.* In the type-specimen the costal spines are very small and low (fig. 70), the axial fossa is divided into secondary calicles and the septa of lesser prominence are more strongly granulated than in *Fungia echinata* (cf. Gardiner 1905, Pl. XCI, fig. 13). As already stated before these characteristics are also found in my specimens. These latter, however, differ from the type-specimen in being somewhat thicker. In correspondence with the thickness

of the corallum the axial fossa does not quite extend to the end of the corallum. Gardiner regards this feature as one of the chief characteristics separating this species from *F. echinata,* but this is probably due to the flatness of the corallum in the type-specimen. Also in flat specimens of *F. echinata* the axial fossa sometimes extends to the anterior and posterior end of the corallum.

Among the material of the Siboga Expedition there is one large specimen from Timor, classified by van der Horst with *Fungia echinata* var. *parvispina* Döderlein (cf. van der Horst 1921, Pl. I, fig. 7). This specimen corresponds in every detail with the specimens in my material and has therefore also to be identified with *Herpolitha simplex.*

There are also two specimens belonging to *H. simplex* in the collection of the U. S. National Museum in Washington. In one of these the axial fossa is divided in seven parts, in the other in four parts. Both have very small costal spines.

In the following table the measurements in mm of all known specimens of *H. simplex* are given:

Locality	Greater diameter	Lesser diameter	Height	Remarks
Banda	84	41	13	
»	85	43	13	
»	89	43	15	
»	119	52	22	
Broome, Australia	150	49	21	after Folkeson (1919).
Banda	192	69	48	specimen regenerated at both extremities.
»	205	73	45	specimen regenerated at one extremity.
»	206	78	50	Tripartite specimen. Breadth measured in one radius.
Philippine Islands	215	91	64	specimen in U. S. Nat. Mus.
S. Nilandu, Maldives	250	65	50	Type-specimen (cf. Gardiner, 1905).
Philippine Islands	252	65	84	specimen in U. S. Nat. Mus.
Siboga Expedition, Stat. 60.	312	100	53	

In the three smallest specimens the axial fossa has not yet divided itself into secondary calicles, but they are easily distinguishable from young specimens of *Fungia echinata* by their smaller costal spines and their granulate smaller septa (figs. 66—69).

Adult specimens of *F. echinata* are usually much broader than specimens of *Herpolitha simplex* of about the same length. Unfortunately two of my larger specimens have broken in the long axis and afterwards regenerated, in normal specimens the length would exceed that given in the table above.

Herpolitha weberi (van der Horst)

Fungia weberi van der Horst 1921.

This species is not represented in my material, but some particulars of it may be dealt with here, as the species is an intermediate form between *Herpolitha simplex* and *H. limax.*

In the description of this species, based on two broken specimens from Stat. 315 of the Siboga Expedition, van der Horst already states that in several points of the original axial fossa two opposite septa have fused across it. This process of fusion is quite the same as in young specimens of *Herpolitha limax* and results in the formation of secondary calicles. A comparison of Gardiner's figure of *Herpolitha foliosa* (1909, Pl. 36, fig. 15) with the figure of *Fungia weberi* (van der Horst 1921, Pl. I, fig. 5) shows at first sight that the fusion of the opposite septa in each of the two species leads to a similar formation of secondary calicles.

In this species there is a strong growth-tendency in the direction of the long axis; nearest to the anterior (or posterior) septum of the first cycle a great many septa of higher cycles have been added which have not yet developed in the lateral parts of the corallum. The number of cycles cannot be determined, for each of the two specimens has regenerated from less than a half of a broken corallum, which may be concluded from the direction of the septa. In the regenerated parts new mouths have developed each with a number of septa the central parts of which are more or less radially arranged round their centre.

In the longer specimen of *H. weberi* there are, besides the calicles in the axial fossa, the first traces of secondary calicles in the lateral parts of the corallum. In some places one of the more

prominent septa has a notch in which two neighbouring septa of less prominence have fused and in this way the centre of a new calicle is formed. In *Herpolitha limax* the new calicles originate in quite the same way. Some of these very young calicles are clearly visible in van der Horst's fig. 5.

Herpolitha limax (Esper).

(Pl. VIII, figs. 78–85, and Pl. IX, fig. 117).

Herpolitha limax Milne Edwards and Haime 1851.

Herpolitha limax van der Horst 1921.

(Other synonyms are given by van der Horst 1921. Cp. below for *Madrepora pileus* Pallas).

Localities: D. Exp. t. Kei Isl.: Banda, 0—25 m, 50 ex.; Ambon, 0—2 m, 2 ex.

In his paper on the Fungid corals of the Siboga Expedition van der Horst (1921) suggests that the species now generally known under the name *Herpolitha limax* as a matter of fact has a right to the name of *Herpolitha pileus* (Ell. and Sol.). The figure of Ellis and Solander indeed represents a form of Herpolitha, but we have first to discuss the forms described as *Madrepora pileus* before Ellis and Solander to make out to which genus the original *Madrepora pileus* belongs.

In the tenth edition of his Systema Naturae (1758) Linnaeus gives a short description of a corallum called by him *Madrepora Pileus.* The form defined here under this name is based on the specimen represented on Tab. LXXXVIII, fig. 3 of Rumphius' Herbarium Amboinense, Pars VI (1750), which is cited in Linnaeus' diagnosis. As may be concluded without any doubt from Rumphius' figure and description, the form dealt with (the *Mitra polonica*) belongs to the present genus *Halomitra* (or *Döderleinia)* and therefore the specific name „*pileus*" has to be retained for a species of this genus. Fig. 2 of the same plate in Rumphius' work represents an oblong corallum, probably belonging to the present genus *Polyphyllia,* which was called by him „*Limax saxea*".

In the twelfth edition of the Systema Naturae (1760) Linnaeus also only refers to Rumphius' Tab. LXXXVIII, fig. 3 as a form corresponding with his *Madrepora Pileus.*

Shortly afterwards (1761) Seba described and figured a number

of corals belonging to the colonial Fungids. In his descriptions he did not use the Linnean nomenclature, but from his figures some particulars are easily to be recognised. In Seba's work there are two figures of corals belonging to the present genus *Herpolitha* (figs. 3 and 5 of Tab. CXI) and there are represented two corals belonging to the present genus *Polyphyllia* (fig. 6 of Tab. CXI and fig. 31 of Tab. CXII).

In Pallas' (1766) *Madrepora pileus* three different forms, now belonging to the genera *Halomitra*, *Herpolitha* and *Polyphyllia* are united. Pallas distinguishes two forms; the form α includes the „Mitra Neptuni" of Tournefort (a highly arched specimen of a species of *Halomitra)*, the „Mitra polonica" of Rumphius *(Halomitra* sp.), the „Pileus Neptuni" of Seba *(Herpolitha* sp.) and the „Madrepora Pileus" of Linnaeus' Systema Naturae Ed. X *(Halomitra* sp.). The form β is the „Limax saxea" of Rumphius and the „Talpa marina" of Seba, both representatives of the present genus *Polyphyllia.*

The description of Ellis and Solander's *Madrepora pileus* (1786) is only applicable to the forms of the present genus *Herpolitha.* According to these authors their species is a synonym of *Madrepora pileus* as defined in the 12th Ed. of the Systema Naturae, but in this latter work the species *Madrepora pileus* is a form of *Halomitra.*

The same synonyms of *Madrepora pileus* which were enumerated by Pallas are given by Gmelin (1788) in the 13th edition of the Systema Naturae and the two forms α and β are distinguished in the same manner as in Pallas' work. The *Madrepora pileus* of Ellis and Solander is placed here under the form α.

Esper (1797) describes as *Madrepora Limax* a form belonging to the present genus *Herpolitha.* His figure is that of Ellis and Solander on a somewhat reduced scale. Esper regards as synonyms of his species the forms figured by Ellis and Solander on Tab. 45 and the one figured by Seba on fig. 5 of Tab. CXI, which are unmistakable representatives of *Herpolitha,* but besides these also the specimens figured by Seba on Tab. CXI, fig. 4 (probably *Fungia echinata)* and fig. 6 (a *Polyphyllia)*, and he places Gmelin's Madrepora Pileus (Linnaei Syst. Nat. Ed. XIII), which contains representatives of *Halomitra*, *Herpolitha* and *Polyphyllia*,

also in the synonymy of his *Madrepora limax*. From his description, however, clearly results that Esper's *Madrepora limax* is based on specimens closely agreeing with Ellis and Solander's *Madrepora pileus*, and that *Madrepora limax* Esper therefore only includes specimens of the present genus *Herpolitha*.

As may be concluded from the foregoing comparison of the older literature, van der Horst's suggestion that Esper's species has a right to the name *Herpolitha pileus* cannot be maintained, for the name *pileus* was originally only confined to specimens resembling Rumphius' „Mitra polonica“, which was a representative of the present genus *Halomitra*.

During the Danish Expedition to the Kei Islands I paid special attention to the collecting of the very young stages of the Fungids, and I succeeded in obtaining by the help of a native diver in the Banda Islands a number of small specimens, some of which have not yet developed secondary calicles. The dimensions of the smallest specimens are in mm:

Greater diameter	Lesser diameter	Thickness of central part	Number of calicles
24	17	5	1
29	18.5	5	1
29.5	22	6	2
33	22.5	6	1
33	23 5	7	1
50	23	8	5
53	27	9	5
55	28	8	3
58	27	7	4
61	34.5	8.5	4

All these specimens possess a definite scar of detachment with a diameter of 4 to 7 mm. The smallest specimens closely resemble a young *Fungia* with an enlarged greater diameter (figs. 78—85). In the first specimen of the table there are five complete cycles of septa and besides a number of septa of the higher cycles, which are yet incomplete. Between the two lateral septa of the first cycle the septa of the higher cycles develop in quite the same way as

usually in *Fungia,* but nearest to the anterior and posterior septa of the first cycle the septa of the higher cycles develop before those of the same cycle in the other half of the same sector. During further growth of the corallum septa of higher cycles are permanently formed nearest to the septa of the first cycle in the long axis of the corallum, whilst the increase in size proceeds chiefly in the anterior and posterior direction. After some time the original single axial fossa is divided into different parts by the fusion of two opposite septa across it. The central parts of the septa of each secondary mouth become more or less radially arranged around it.

In specimens of about 120 mm greater diameter the first traces of the formation of secondary calicles at the lateral parts of the corallum are visible. These secondary calicles are at first very indistinct but in the course of further growth the radial arrangement of the septa becomes more pronounced and the centre deepens.

The general shape of the corallum of *Herpolitha limax* is very variable as appears from the following examples: The measurements of two specimens in which no traces of former regeneration can be found are: length 207 mm; breadth (in the central part) 89 mm, height (in the central part) 51 mm, and length 195 mm, breadth 56 mm and height 39 mm. The dimensions of the longest specimen in the collection are: length 353 mm, breadth 68 mm and height 60 mm. There are yet some apparently much older ones which have broken into fragments and afterwards have regenerated. The breadth of two of these coralla is 86 and 110 mm, their height respectively 91 and 95 mm. These specimens are strongly trough-shaped.

Regenerated specimens are usually at first sight recognisable by their irregular form. In the regenerated parts the chief septa often have a direction at right angles to that of the chief septa of the original fragment. The regular axial fossa is often wanting in the regenerated parts.

Phenomena of budding at the lower surface of the corallum are also in this species often connected with previous fracture and regeneration of the disc. In one specimen two stages of these buds have developed. A part of the disc had lost its living tissue and was overgrown with algae. At the margin of the dead portion the

corallum is regenerating by the formation of new septa. At the lower surface, beneath the dead part a young stage of a lateral bud is visible. The septa of the bud, which have developed by broadening of the costal spines, are clearly radially arranged round its centre. In another part of the same corallum an older stage of a lateral bud is to be seen, which is attached with a broad base to the mother-corallum. It has a very deep axial fossa and distinctly radiating septa. The septa are much thicker than those of the youngest coralla of *Herpolitha* developed from planulae; on the whole the bud reminds one strongly of a young attached *Fungia*.

In another specimen of *Herpolitha* there is a bud in the neighbourhood of a regenerated part. Here also the septa are distinctly radially arranged round the central axial fossa (fig. 117). The arrangement of the septa in different cycles is somewhat indistinct, but at first sight this bud shows a great resemblance with lateral buds of *Fungia*.

In Dana's type-specimen of *Herpolitha crassa* also buds have developed at the lower surface. In the figure of this specimen given by Vaughan (1918, Pl. 53, fig. 1) two large buds with radial arrangement of the septa are visible, situated close to one another at one end of the corallum.

It is a noticeable fact that the lateral buds in the colonial Fungids (cf. also the description of these processes in the species of *Halomitra)* have the shape of a young *Fungia*, even more than the young forms of the same species of the same size that have developed from planulae. The genus *Fungia* is the most primitive of the family and these buds, which take their origin in places where normally no calicles are formed, always assume the primitive circular shape. They also remain much longer solitary than the anthocyathi which develop from planulae (cp. also below under *Halomitra philippinensis*).

Polyphyllia Quoy and Gaimard.

The 46 specimens of this genus collected by the Danish Expedition to the Kei Islands all belong to the species *P. talpina* (Lam.), the original description of which was based on Seba's Tab. CXI, fig. 6 and Tab. CXII, fig. 31 (1761).

Polyphyllia talpina (Lam.)

(Pl. VIII, figs. 86—92, Pl. IX, figs. 109, 110).

Cryptabacia talpina Bedot 1907.
Polyphyllia talpina Gardiner 1909.
Polyphyllia producta Folkeson 1919.
Polyphyllia talpina van der Horst 1921.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 12 ex.; Doelah laut, Kei Islands, reef, 1 ex.; Banda, 0—25 m, 33 ex.

The general form of the corallum is very variable (cf. also Quelch 1886 and van der Horst 1921). Many specimens are very long and narrow, in these the calicles of the axial furrow can usually at first sight easily be distinguished (fig. 109). Other specimens are much broader and here often the lateral calicles have the same subradial arrangement of the septa as those of the axial furrow, which latter then becomes more or less indistinct (fig. 110). A specimen of long and narrow shape with very marked axial calicles was described by Folkeson (1919) as a new species, *P. producta*. I have in my material a number of specimens which correspond in every detail with Folkeson's description. These specimens, however, cannot be separated as a distinct species from the other ones with less pronounced axial calicles, for between the two extremes every intermediate stage is to be found. The denseness of the corallum also is not a characteristic found only in the long, slender specimens. Therefore the form *producta* is a variety of *P. talpina* only.

In the following table the measurements of some of the specimens are given in mm.

The first specimen in the table (figs. 90—92) was just detached from its stalk when it was collected. The stalk is very short and is fixed with a broad base to a dead piece of coral. The calicles in the axial furrow have neatly radiating centres, the lateral calicles are very indistinct. Only their centres are visible, which have been formed by the coalescence of two of the thinner septa over a notch in a thicker septum. There are already a great number of these centres of lateral calicles. The septal arrangement of this young colony is characterized by the stronger development of the higher cycles nearest to the anterior and posterior septa of the first cycle, and therefore only the septa of the central calicle have

developed in quite the same way as in young stages of circular Fungiae. In older specimens the septa are divided into so many

Locality	Greater diameter	Maximum of lesser diameter	Maximal height	Number of calicles in axial furrow
Banda	43	13	8	7
„	54	11	7.5	7
„	60	11	8	12
„	91	12.5	7	20
„	96	22	12	14
Amboina	125	56	19	23
Banda	141	25	14	25
„	202	47	26	32
„	248	28	17	52
Amboina	287	73	49	—
Doelah laut	314	97	73	—
Amboina	383	100	82	--
Banda	458	55	36	75

small pieces by the formation of the secondary mouths that the septal arrangement of the corallum presents little likeness to that of *Fungia*.

Halomitra Dana

The study of the specimen of *Zoopilus echinatus* Dana (probably the type-specimen) in the U. S. National Museum in Washington has convinced me that this form in its essential characteristics belongs to the genus *Halomitra*. Its structure proves that it is the most primitive form of this genus hitherto known. More peculiarities concerning this specimen will be found below under *Halomitra echinatus*.

I include in this genus also the specimens belonging to Gardiner's genus *Döderleinia*, which differ from the other species by their thickness and their rough, more or less ramified costal spines and strong granulation of both surfaces. These differences are of slight importance, in all essential characteristics these species agree with the other species of *Halomitra*, which have more or less smooth costal spines. Moreover *Halomitra echinatus* represents in

some respects an intermediate stage between the species of *Halomitra* with smooth spines and those of the genus *Döderleinia.*

Besides the species belonging to his genus *Döderleinia* Gardiner (1909) recognizes as true species of *Halomitra* only four of Studer's (1901) species, viz. *H. pileus* (Dana), *H. tiara* (Agassiz), *H. concentrica* Studer, and *H. philippinensis* Studer. The other species which were placed by Studer in this genus are in reality representatives of other genera. As for *H. fungites* Studer there is much evidence that it is an abnormally developed *Fungia fungites* (cf. above).

Madrepora pileus L., which was based on Rumphius' *Mitra polonica* is a representative of the genus *Halomitra* as I have already pointed out in the previous pages under *Herpolitha limax. Halomitra pileus* Dana and *H. pileus* M.-E. & H. probably are based on somewhat different forms and perhaps both of these again differ from Rumphius' species.

As already has been stated by Gardiner (1909) the four species *pileus, tiara, concentrica* and *philippinensis,* as these have been defined by Studer (1901), seem to be closely related. Many of their specific characteristics, however, are subject to strong individual variation, caused by external influences. With the exception of *H. pileus* Studer they cannot be distinguished as different species and I have therefore united the three other forms under the name *H. philippinensis.*

Halomitra pileus Studer is in all probability the same form as *H. pileus* Dana (= *H. clypeus* Verrill). I have examined a specimen from Fiji, collected by the U. S. Exploring Exp., in the U. S. National Museum, which was labelled *Halomitra clypeus.* Probably this specimen is the type of the species. The corallum is rather thick, the costal spines are strongly developed (larger than in *H. philippinensis)* and almost quite smooth. The septal dentations are usually blunt, the septa are as a rule thicker than in *H. philippinensis.* On account of these differences *H. pileus* Dana has to remain separated from *H. philippinensis* Studer.

As for *Halomitra tiara* Agassiz (cf. also Studer, 1901) the specimen in the Museum of Comparative Zoology in Cambridge (Mass.) differs from the specimens in my material which I refer

to *H. philippinensis* only in thickness of the corallum, the structure of the septa and the costae is alike in these forms.

Halomitra echinata (Dana)

(Pl. X, figs. 123–125, Pl. XI, figs. 134 and 135).

Zoopilus echinata Dana 1846.

Locality: D. Exp. t. Kei Isl.: Banda, 0—2 m, several fragments, belonging to at least 3 ex.

The description of *Zoopilus echinatus* by Dana is rather short and the figures of this form published by the same author are altogether insufficient. In one specimen of this species in the U. S. National Museum in Washington (probably the type-specimen) the central calicle is still to be found, all the other specimens which I have seen are regenerated from a small fragment. As the species is very incompletely known I give here a new description, based on the specimens in my material, the specimen in the U. S. Nat. Mus., and those in the Mus. of Comp. Zool. in Cambridge (Mass.). The material of this species in the latter museum consists of three specimens: one regenerated colony from Fiji, collected by the U. S. Exploring Exp., and two regenerated colonies from Fiji, collected by A. Agassiz in 1897.

Corallum very thin (5—12 mm) and fragile, convex above and concave below. Theca very strongly perforated, often with long slits (up to 5 mm) in rows between the septa and costae. Chief septa alternating with 2—5 septa of lesser prominence. These latter are much thinner than the chief septa and are strongly granulated and irregularly dentated. The chief septa possess long blunt dentations of which 3—6 are found in a space of 10 mm, they are minutely granulated and the apex is often divided into secondary dentations. With the exception of those in the central region of the specimen in the U. S. National Museum hardly any of the chief septa are divided into parts by the formation of the (secondary) calicles, for the greater part they are found uninterrupted from the central area till the margin. The central calicle (fig. 135) is large, shallow, with radial arrangement of the septa. It is surrounded by a number of somewhat smaller secondary calicles in the centre of which the large septa are broken. These calicles have the same general appearance as those in *H. philippinensis.* In the remaining part of

the corallum there are a great number of smaller calicles. In Dana's figure (1846, Pl. 21, fig. 6) they are not represented, but in figs. 123 and 135 of the present paper some of them are visible. These calicles, which are extremely small, are situated between two of the chief septa. Their centre is formed by the fusion of some of the smaller septa, a columella has not developed. In the regenerated specimens only these small calicles are to be found, except in one specimen in my material next to the line where the regeneration has begun. Here a number of somewhat larger calicles are present, but they are far more irregular than those of the specimen of fig. 135.

The lower surface of the corallum has well-marked costae corresponding with the septa, and therefore radially arranged. The spines of the chief costae are large, blunt, often divided at the apex and always beset with thin ramifications. The chief costae alternate with some costae of less prominence. On the lower surface of the specimen of the U. S. National Museum a distinct scar of detachment is visible beneath the central calicle (fig. 134, cf. also Vaughan, 1905).

This species is at first sight easily to be distinguished from the other species of *Halomitra.* Its inconspicuous secondary calicles give a very even appearance to the upper surface of the corallum (figs. 123, 135). The costal spines show some resemblance with those in some specimens of *H. robusta,* but they are more separately distributed (figs. 124, 125, 134) and on the whole the corallum is very light and fragile whilst the corallum in *H. robusta* is very heavy and solid.

I have used in the above diagnosis the term „chief septa" for the septa of the lower cycles and the marginal part of those of the higher cycles with which two septa of a next higher cycle have fused. In the specimen in which the central calicle is present the different cycles of septa can be easily distinguished for they are placed in more or less straight lines from the centre till the margin.

Owing to the regeneration in the larger part of the specimens there are the usual abnormalities in the course of the septa: in some points the new formed septa have a direction at right angles to that of the septa in the original fragment.

The generic distinction of *Zoopilus* from *Halomitra* was already

doubted by Vaughan (1905) and Gardiner (1909). It is a more primitive form than the other species of *Halomitra* on account of the fact that the majority of its secondary calicles are very inconspicuous. The number of comparatively large secondary calicles in one of the specimens (fig. 135), however, gives to this species almost the same appearance as that of young forms of the other species of *Halomitra*.

Halomitra philippinensis Studer

(Pl. VIII, figs. 93—98, Pl. IX, figs. 105, 106, 111, 118, 119, 121, Pl. XI, figs. 127 and 129).

Halomitra tiara Studer 1901.
Halomitra concentrica Studer 1901.
Halomitra philippinensis Studer 1901.
Halomitra philippinensis Gardiner 1909.
Halomitra pileus van der Horst 1921.
Halomitra tiara van der Horst 1921.
Halomitra louwinae van der Horst 1921.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 1 ex.; Banda, 0—25 m, 122 ex.

I classify with this species all specimens of *Halomitra* with almost smooth costal spines in my collection. The corallum is thin, in those specimens in which the central calicle is present it is much larger than the secondary calicles, the septa and costae are radially placed round the centre, at least in the marginal part of the corallum, the theca is perforated. The costal spines are not altogether smooth, they are provided with a few small granulations and have therefore a somewhat rough appearance, their apical part is often slightly ramified (fig. 129). This characteristic is also mentioned by Studer for *H. philippinensis* and chiefly on account of this feature I have identified them with this species. After Studer the columella is rudimentary and spongy in the bottom of the calicles, in my specimens the columella is often visible as a mass of irregular trabecula and in other calicles it is almost completely wanting.

The four species of *Halomitra* described by Studer are very closely allied, as already Gardiner (1909) remarks. In my opinion at least three of Studer's species, viz. *tiara, concentrica* and *philippinensis,* belong to the same species, whilst *H. pileus* Studer

perhaps may constitute another species. The characteristics of the four species, as these are defined by Studer, are given in the following table:

species	*pileus*	*tiara*	*concentrica*	*philippinensis*
Thickness of corallum	20—30 mm	12—20 mm 13—18 mm	15—18 mm	15 mm
Theca	?	with numerous irregularly scattered pores	with scattered pores	strongly perforated
Costae	sharp spines on radially arranged costae	radially arranged with smooth pointed spines	radially arranged with pointed conical spines	marginal part radially arranged; spines small, rough
Septa	strongly prominent, thick; strongly inciso-dentate	thinner than in *H. pileus*	thin and delicate; deeply serrate	thin
Calicles	central calicle very little more distinct than the secondary calicles	central calicle little more distinct than the secondary calicles	central calicle large; secondary calicles in almost regular concentric rows	central calicle large; secondary calicles in irregular concentric rows
Septa of the secondary calicles	strongly prominent	prominent, but less than in *H. pileus*	prominent	strongly prominent
Columella	papillary	rudimentary	?	wholly rudimentary (Studer, p. 414); spongy in the bottom of the calicles (Studer, p. 415)

It is uncertain if Studer's *Halomitra tiara* is a synonym of *H. tiara* Agassiz, described by Verrill (1864). According to Verrill the theca in *H. tiara* is solid, whilst Studer states that the theca in his specimens has many irregularly scattered pores. Therefore I have retained the name *H. philippinensis* for the species in which the three above-mentioned species of Studer are united.

I cannot decide if Studer is right in placing M.-Edwards and Haime's *Halomitra pileus* in the synonymy of his *H. tiara*. There is much evidence that *H. pileus* Dana is quite different from *H. pileus* M.-E. and H., and again *H. pileus* Studer may differ from both of the other species of the same name. But I have not sufficient material for a comparative study of these forms.

The specimens in the Amsterdam and the Leyden Museum referred by van der Horst (1921) to *H. pileus* and *H. tiara* belong to the same species as those in my material. In every specimen the costal spines possess in their apical part minute granulations or small ramifications. *H. louwinae* van der Horst is based on regenerated specimens of the same species (cf. below).

The greater part of my material of this species consists of regenerated fragments, only in eight specimens the central calicle is yet present. This latter is larger than the other ones and has distinctly radially placed septa. The youngest specimen is an anthocyathus which has but recently detached from its stalk. Its lower surface has a distinct scar of about the same size as that in specimens of *Fungia* (fig. 98). At the upper surface there are besides the large central calicle three well-developed secondary calicles and the first traces of some more of these calicles (fig. 97). In the parts of the corallum where the formation of secondary calicles has not yet taken place the different cycles of septa can be distinguished in the same manner as in *Fungia*. There are seven complete cycles of septa, the pairs of septa of the higher cycles have fused with the marginal part of a septum of a next lower cycle. In older specimens the septa are divided into parts by the formation of the secondary calicles and the different higher cycles are no more to be distinguished. In this very young specimen the costal spines already are provided with granulations and minute ramifications as in the larger colonies of this species. The measurements

of this young specimen are: length 61, breadth 55, height 21, thickness of marginal part 4—5 mm.

The measurements of the larger specimens with central calicle are given in the following table:

Locality	Greater diameter mm	Lesser diameter mm	Height
Banda	123	119	49
„	182	195	190
Amboina	206	205	97
Banda	235	227	73
„	238	235	190
„	245	230	130
„	296	293	145

The thickness of the corallum varies between 7 and 15 mm. The colonies of *Halomitra philippinensis* may grow out to a much larger size, one specimen which doubtless belongs to the same species measures 56 cm in diameter (cf. Mortensen 1923 p. 77). It has regenerated from a fragment but has a very regular shape. All the larger specimens in my material have an arched form, some are very high in comparison with the diameter of the marginal part, e. g. the second and the fifth specimen of the table.

The figured larger specimens present the following peculiarities: One arched specimen (fig. 105) has a very large central calicle and secondary calicles arranged in more or less circular rows. The secondary calicles project somewhat above the neighbouring parts. Another specimen (fig. 106) is regularly arched, the central calicle is less distinct, though easily to be distinguished from the secondary calicles. These latter project only very little above the neighbouring parts and they are more crowdedly distributed over the upper surface. A third specimen (fig. 111) is much higher than broad, it has a large central calicle and very little projecting secondary calicles. There are comparatively few calicles in this colony. The fourth specimen (fig. 118) is much flatter than the three preceding ones, it has a large central calicle and its secondary calicles, of which there are a great number, considerably project above their neighbourhood.

The greater part of the specimens were collected at Banda on the slope of the Goenoeng Api. It is a conspicuous fact that such a great number of specimens have regenerated from fragments. Partially this is undoubtedly due to the stones which drop constantly from the mountain into the sea. In one very restricted locality the diver collected 36 regenerating fragments, most of which were of small size. A couple of these are represented in figs. 93—96. The parts of the mother-corallum with nearly parallel septa and costae are easily to be distinguished in the centre of the regenerated specimens, whilst the new formed parts have septa and costae which are arranged radially round the centre of the original fragment and therefore these new septa and costae are in some places directed at right angles with those of the central part. In further growth of the colony these new parts enlarge and the colony usually assumes an arched form. Then the only differences with normal colonies are found in the central part, where a central calicle is wanting and some of the septa and costae have an abnormal course. A number of such regenerated specimens of *H. philippinensis* are described by van der Horst as the new species *H. louwinae.* I have compared these coralla with a number of specimens of *H. philippinensis* in my collection and they prove to be quite identical. Some of van der Horst's specimens were also collected in the Banda Islands and their costal spines have a few grains at the top (cf. van der Horst 1921), a characteristic which is invariably found in all specimens of *H. philippinensis* in my material. The mode of growth of the colonies of the Siboga Expedition is the typical one found in regenerating specimens.

In one regenerated specimen with a longer diameter of 342 mm a large bud has developed at the lower surface as an irregularity of growth where two regenerated parts of the colony have fused (fig. 127). It is attached with a broad base to the colony, the larger diameter of its marginal part is 44 mm. Its calicle has divided into two parts by the fusion of two opposite septa. This young individual may be a true lateral bud, but it is also possible that it has developed in a similar way as the false buds which are described in the following pages in *Halomitra robusta.*

True lateral buds are found in one very regularly developed specimen with an obvious central calicle. At the lower surface of

this specimen there are seven buds, one of which is attached to the lateral surface of an older one. The youngest stage (fig. 121) is already clearly stalked, but its uppermost part has not yet enlarged. In the course of further development the stalk becomes longer and the marginal part of the bud broadens. The largest bud has a conical form, its upper surface is deeply hollowed and at the bottom several calical centres are to be seen. The shape of these buds is quite different from that of young specimens of Halomitra which have developed from planulae, these latter are much thinner and much flatter than the lateral buds. A further difference is found in the arrangement of the septa: in the lateral buds these are fairly radially arranged but the different cycles cannot be distinguished with any certainty, whilst in normal young specimens of *Halomitra* these are easily found.

Some colonies were found lying upside down on the bottom. This abnormal situation has caused a reversed mode of growth of the marginal part, which has folded towards the lower surface of the corallum and now the septal faces of the new part of the corallum are turned again towards the light (fig. 119). This folded marginal part had already reached a fairly large size, the coralla had therefore already been in the reversed condition during some time. Notwithstanding that they were on the whole in a healthy state.

Halomitra robusta (Quelch).

(Pl. VIII, figs. 99—104. Pl. IX, figs. 107, 108, 112—116, 120, 122, Pl. X, figs. 130–133).

Podabacia robusta Quelch 1886.
Halomitra irregularis Gardiner 1898.
Podabacia irregularis Studer 1901.
Podabacia robusta Studer 1901.
Podabàcia robustă Bedot 1907.
Döderleinia irregularis Gardiner 1909.
Döderleinia robusta Gardiner 1909.
Döderleinia robusta van der Horst 1921.
Döderleinia irregularis van der Horst 1921.
Döderleinia sluiteri van der Horst 1921.

Localities: D. Exp. t. Kei Isl.: Amboina, 0—2 m, 2 ex.; Doelah laut, Kei Islands, reef, 1 ex.; Banda, 0—25 m, 59 ex.

The study of the comparatively large collection of specimens in my material belonging to Gardiner's genus *Döderleinia* com-

pels me to unite the three described species into one species of somewhat variable character, which has to keep the name *Halomitra robustra* (Quelch). The three forms cited above, which are

„species“	*robusta*	*irregularis*	*sluiteri*
Theca	extremely perforated	little perforated	strongly perforated
Costae	subdistinct (Quelch, Studer, Bedot); in quite distinct rows (Gardiner); all stages between distinct and indistinct (van der Horst).	not distinct.	in obvious rows.
Septa	very distinctly radiating from the central calicle to the edge of the corallum (van der Horst).	not arranged in rays (van der Horst).	in radiating rows.
Calicles	apparently arranged around a central calicle (Quelch, Studer); central calicle easily recognizable (Bedot, van der Horst).	central calicle in adult specimens not to be distinguished from the others.	central calicle not distinguishable; few secondary calicles, no calicles in the marginal part.
Columella	slightly papillose, rudimentary (Quelch); pseudocolumella (Bedot); columella clearly visible (Gardiner).	wanting.	poorly developed.
Thickness of corallum	20 mm (Quelch) 15 mm (Bedot).	thick, heavy.	10 mm.

described as different species are distinguished from one another only by characteristics, which are due to strong individual variation. I have in my material a number of specimens, which closely fit in with the typical form of each of the three described species. More or less typical representatives of the three described „species“ are represented in fig. 112 (the form *robusta),* fig. 122 (the form *irregularis)* and fig. 114 (the form *sluiteri).* There are also a great many which have some particulars by which they have to be identified with one of the three so-called species, and besides these other features on account of which they would have to be referred to another. In the preceding table the essential characteristics by which the three described forms are distinguished are given.

The perforations of the theca are found in all younger specimens, and also in the older colonies in which the corallum is not very thick. When the thickness of the corallum increases the perforations are wanting in the greater part of the corallum and only some small slits are found in the marginal part. Some specimens which have a nearly altogether solid theca possess a distinct central calicle of larger size than the secondary calicles and septa, which are for the greater part neatly radiating from the centre to the periphery.

In many specimens the costae are quite distinctly visible in the greater part of the lower surface whilst in other specimens this surface is densely covered with spines, which show no radial arrangement. These differences are found in specimens possessing all other characteristics ascribed to the form *robusta,* and the costae therefore present no constant peculiarities by which the form *robusta* can be separated from the form *irregularis,* a fact which also has been stated by van der Horst (1921). According to van der Horst the arrangement of the septa is the criterium by which the two forms may be distinguished. In *D. robusta* the septa are radiating from the obvious central calicle to the margin of the colony whilst in *D. irregularis* the septa have an irregular course. Now in all very young specimens the septa of the originally simple corallum are distinctly radiating from the centre to the margin and this may remain so after further growth of the colony. In many specimens, however, the formation of the great number of secon-

dary calicles in the central part leads to irregularities and excrescences and then the radial arrangement of the septa is only visible in the marginal part. It is impossible to separate the specimens with radially arranged septa from those with septa with an irregular course, for the two extremes are connected by all possible transitional stages. Moreover in the small specimen of *Döderleinia irregularis*, described and figured by Gardiner (1909, Pl. 39, fig. 28), the septa form more or less straight lines radiating from the central part of the corallum. The irregularities found in this specimen are only due to regeneration.

A central calicle of larger size than the secondary ones is found in a large part of my specimens, especially in those with distinctly radiating septa, but these two characteristics are not always found together. A columella has developed in nearly all specimens at least in some of the calicles, it may be almost rudimentary or projecting distinctly in the centre of the axial fossa. The depth of the fossa varies in connection with the height of the septa.

The thickness of the corallum is also subject to strong variation, as a rule the strongly arched specimens are much thicker than the flatter colonies. In the larger specimens the thickness of the corallum at some distance of the margin varies between 15 and 25 mm.

For the reasons given above I unite the forms *robusta* and *irregularis* into one species, in which also the form described by van der Horst as *Döderleinia sluiteri* must be included. I have in my material a number of specimens showing the same peculiarities (small height, few secondary calicles, marginal part with long uninterrupted parts of septa, corallum thin) as given in the diagnosis of *D. slüiteri*. These peculiarities are found in a great many young specimens and in those older ones which have not assumed an arched form (figs. 108, 114). The marginal part of these coralla enlarges in a horizontal direction and is usually very irregular in shape, especially in very large specimens (fig. 113). In the arched specimens the weight of the whole colony is supported by the margin, in these flatter specimens the margin projects freely (the lower surface of the corallum touches the sea-bottom in many places) and may grow faster than in the arched specimens. This will be probably the cause of the different shape of the marginal part in

these two forms. The flatter specimens keep the same appearance as the very young ones in which the marginal part has a rapid growth on account of which long uninterrupted parts of septa develop. In the arched specimens the weight of the colony causes a very slow growth of the margin and this results in the formation of relatively more calicles in the marginal part (fig. 107).

There is one specimen in the collection, which at first sight seems to differ from *H. robusta* in characteristics of specific value. The upper surface of this specimen has a very smooth appearance (figs. 104 and 116). In the central part the calicles are fairly crowded, but in the marginal part there are only few calicles of small size. The septa between the calicles in the central part have assumed a somewhat meandering course. The parts of the septa round the calical centres are neatly arranged in a radial manner, a columella is in most of the calicles well-developed. The septa are thinner than usually in specimens of *H. robusta* and their dentations are of smaller size. The spines on the lower surface are arranged in definite rows, they are very small but clearly granulated.

Another specimen in the collection (fig. 115) has somewhat thicker septa and larger septal dentations, but agrees in other respects closely with the specimen of fig. 116. Between these two aberrant specimens and normal specimens of *H. robusta* every intermediate stage is found in specimens of my collection and I am therefore convinced that they undoubtedly belong to the same species, of which they perhaps may constitute a variation caused by local influences.

The following table contains the measurements of a number of very young specimens from the Banda Islands. In some of these already a great number of calicles have developed.

In the greater part of these young specimens a distinct scar of detachment is visible. Besides these I have one stalked specimen (fig. 99) the anthocyathus of which has a somewhat irregular shape. It has afterwards detached from its stalk, which is in comparison with the stalk of young Fungiae very large, its dimensions being 29×23 mm, its height about 18 mm. This peculiarity is always found in the young stages of this species, whenever the scar is visible it has always the same large dimensions (figs. 101, 103).

The scar is strongly perforated, in somewhat older specimens the central part of the corallum soon becomes solid.

The very young stages with few calicles (figs. 100, 102) strongly remind one of young Fungiae, they have the same arrangement of

Greater diameter mm	Lesser diameter mm	Height mm	Number of calicles
47	35	17	1
54	39	15	2
53	45	14	14
58	53	26	30
61	50	22	15
64	49	15	18

the septa. In the first two specimens of the table six complete cycles of septa are present and some members of the seventh cycle.

The two largest specimens in the collection are a strongly arched one from Amboina (fig. 107, length 358, breadth 225, and height 123 mm) and a horizontally spreading one with irregularly developed marginal part from Banda (fig. 108, length 385, breadth 276, and height 47 mm).

When collecting the specimens I made a special search for colonies presenting phenomena of regeneration and lateral budding, and I succeeded in obtaining a large number of specimens of this kind. In regenerated specimens the septa of the new formed parts are directed in many places at right angles to those of the original fragment (cf. Gardiner 1909, Pl. 39, fig. 28), but the general appearance of the corallum does not differ much from normal colonies. Usually the central calicle is not to be found in such regenerated colonies.

Budding at the lateral surface (the lower surface) of this species was first described by Gardiner in his type-specimen of *H. irregularis* which possesses at its lower surface two stages of these buds (cf. Gardiner 1898, Pl. 43, fig. 2). In my material there are also a number of colonies showing the formation of these buds and owing to the very small size of some of them they undoubtedly have been formed at the lower surface and are therefore true

lateral buds. The septa of these buds are gradually passing into the costae of the mother-corallum. Usually the young stages have a somewhat irregular shape, the larger ones are more regularly built and possess radially arranged septa.

In a large number of specimens belonging to this species the peculiar formation of daughter-individuals has taken place, which Studer (1880) first described in *Herpolitha limax*. These daughter-individuals were called by Studer „scheinbare Knospen". The development of these false buds is caused by irregular growth of the margin of the colony, by which process sometimes a part of the upper surface with its septa is bent towards the lower surface of the corallum. In this way a kind of fold is formed and in further growth the parts of the theca nearest to the folded portion may fuse and extend further outwards. Then a portion of some of the septa is divided from the remainder and is wholly surrounded by the lower surface of the corallum. The septa of this false bud become more or less radially arranged round a mouth which develops in its centre and then the young individual may obtain quite the same appearance as true lateral buds, i. e. buds which have developed on the lower surface and whose septa have grown out from flattened costal spines. Studer mentions the fact that similar false buds sometimes occur in *Fungia*, in former papers (1922, 1923 b) I too have described some specimens of *Fungia fungites*, which showed the different stages of the formation of these false buds.

As in *Fungia* we may name in *Halomitra* the upper surface the calical surface of the corallum, whilst the lower surface represents the lateral surface. This is at first sight visible in the very young stages of *Halomitra* which possess as yet no secondary calicles. The upper surface from the centre till the margin is the calical part of the corallum, the secondary calicles develop between the centre and the margin and are therefore situated at the calical surface. The usual asexual reproduction of *Halomitra*, by which process the normal colonies are formed is therefore a kind of calical budding. True lateral budding occurs in *Halomitra* only very exceptionally, the false buds described above have in reality arisen by a process of calical fission, for they are derived from parts of the upper surface. The only cause of the formation of these false buds is the

irregular growth of the theca in some parts of the margin; the septa always remain on the upper surface of the theca, but when the wall is curved towards the lower surface they only seem to have grown out from the lower surface. In Korschelt and Heider's textbook (1910) also mention is made of these false buds. Here Studer's figure (Fig. 358, p. 512), representing the lower surface of a *Herpolitha limax* (not the upper surface as is stated in the explication of the figure) is reproduced. The description of this process of asexual reproduction in Korschelt and Heider is not altogether correct for we find here the following remark: »Etwas schwer verständlich will es bei diesem Vorgang erscheinen, dass die Aussenwand bei einer solchen Entstehung des neuen Individuums nach dessen Inneren zu liegen kommt, die Septen aber nach aussen gerichtet sind, wie dies so dargestellt wird“ (p. 512). In the development of the false buds, however, the septa remain always on the same surface of the theca (the calical or upper surface).

Three different stages of the formation of these false buds are represented in figs. 130—133. The first traces of the folding of the margin of the colony is seen in figs. 130 and 131. It is easily to be seen that the septa of the future false bud are in connection with those of the mother-colony. Fig. 132 represents a further stage. The septa of the false bud are separated from those of the mother-colony, but a groove indicates the place of the folding. In fig. 133 a large false bud is visible at some distance from the margin which still shows clearly the place of the folding. In these specimens there is no doubt as to the origin of the septa of the false buds from parts of the upper surface.

In two specimens which were found lying upside down on the bottom the marginal parts have grown further inwards and especially in one of these (fig. 120) only a small opening is left at the marginal part of the colony. The living tissues were present in the normal condition on both surfaces of the colonies.

Geographical Distribution.

Gardiner (1909) has recorded the data available till that year concerning the geographical distribution of the species of the genus *Fungia*. I have only little to add to tnis author's statements, chiefly

some facts in connection with the new species described in the present paper and the previous one (Boschma 1923c).

The distribution of the three forms united in Döderlein's *Fungia patella* is the following:

Fungia hexagonalis: Friendly Islands (Moseley 1881), Philippines (Quelch 1886, Milne Edwards and Haime 1851), Paternoster Islands and Banda (Boschma 1923c).

Fungia patelliformis: Ralum, Neu Pommern (Döderlein 1902), eastern part of East Indian Archipelago (Boschma 1923c), Sulu Islands, Java Sea, Siam, Hawaiian Islands. In this latter locality the species was not found in a living state, but the specimens show the typical characteristics of *F. patelliformis.*

Fungia fragilis: Philippines (Quelch 1886, *Cycloseris freycineti* and *C. discus),* Andaman Sea (Alcock 1893), Ralum, Neu Pommern (Döderlein 1902, *F. patella* var. *filigrana),* Hawaiian Islands (Vaughan 1907), Seychelles (Gardiner 1909), eastern part of East Indian Archipelago (Boschma 1923c).

One of the species of *Fungia* dealt with in this paper, viz. *Fungia laciniosa,* is hitherto known only from Banda. *Fungia marginata* was besides in the Banda Islands also collected in the Paternoster Islands (Boschma 1923c). As for *F. moluccensis* one of the specimens described by van der Horst (1919, 1921) was found in the Moluccas, the locality of the other is unknown. In the present material there are 12 specimens of this species from Banda, but it occurs probably also in the neighbouring islands. It certainly has a much wider range of distribution, for in the Museum of Comparative Zoölogy in Cambridge (Mass.) there is one specimen from Singapore, labeled *Pleuractis elevata* Verrill, which without any doubt is a representative of *F. moluccensis.* There is no description of *Pleuractis elevata* published, and consequently the species has to keep the name *F. moluccensis.*

Fungia distorta is found farther towards the eastern part of the Indian Archipelago than it was recorded by Gardiner. It is a very common species in the Banda-group and in the Kei-Islands.

The species from the Hawaiian Islands described by Vaughan (1907) as *Fungia patella,* for which I have substituted the name *Fungia vaughani,* is after Vaughan (1907c) and Gravier (1911) also found in the Red Sea.

Another species, which is known from widely separated localities is *Fungia somervillei*. Gardiner (1909) has described specimens from the Seychelles and from the Amirante-group. The specimen described in the present paper was found in the Sulu Islands. The identity of van der Horst's specimen from the Paternoster Islands with *F. somervillei* is not quite sure.

Fungia granulosa is known from the Red Sea (Döderlein 1902), from Rotuma (Gardiner 1909) and from Larantuka, Celebes (van der Horst 1919). Moreover it was found by the Danish Expedition in the Banda Islands. It has therefore a much wider distribution than formerly was known. *Fungia scutaria*, which was previously not found in the East Indies (Gardiner 1909) also occurs in the Banda Islands. As for *F. horrida* I am not quite sure about the identification of my specimens with this species. If this may prove to be correct, this new locality forms a connection between the two hitherto known ones, viz. the Red Sea (Döderlein 1902) and the Pacific region (Fiji Islands, Dana 1846, and Tahiti, Quelch 1886).

As for the other species of *Fungia* dealt with in the present paper Gardiner already states that these were found in the East Indies. *Fungia fungites*, which is a very widely distributed species was found also in Siam.

Two of the species of the genus *Herpolitha (simplex* and *weberi)* are only known from a few localities. *Herpolitha simplex* was found in the Maldives (Gardiner 1905), between Samau Island and Timor (van der Horst 1921, *Fungia echinata* var. *parvispina)* and in Australia (Broome, Folkeson 1919). To these now the Banda Islands can be added as a locality, where the species is fairly common. *Herpolitha weberi* is known only from the Paternoster Islands (Stat. 315 of the Siboga Expedition, van der Horst 1921). *Herpolitha limax* now includes all the other previously described species of the genus and this species is very abundant in the East Indies and in the Red Sea. It also occurs in other localities of the Indo-Pacific, but it has after Gardiner (1909) not yet been found in the Chagos and Seychelles regions. Probably it will also be found there, for van der Horst (1921) records a specimen from Mauritius.

The material of *Polyphyllia talpina* from the Danish Expedition

was collected in the Moluccas. Previously this species was already known from Amboina (Bedot 1907).

Except *Halomitra echinatus,* which is only known from Fiji and from the Banda-group, the species of the genus *Halomitra* are found everywhere in the eastern part of the East Indian Archipelago and in the Pacific region. *Halomitra philippinensis* is moreover found in the Philippines (Studer 1901) and in the Maldives and Chagos-group (Gardiner 1905, 1909). *Halomitra robusta* is recorded from the west point of Timor (Siboga Expedition, Stat. 303, van der Horst 1921), Amboina (Quelch 1886, Bedot 1907), Banda, Kei Islands (the present author), Funafuti (Gardiner, 1898), Japan and Torres Straits (van der Horst 1921). It is uncertain if the specimen in the Leyden Museum for which the locality „Japan“ is given, in reality has been found there. The specimen of *H. robusta*, identified by van der Horst (1921) with *Döderleinia irregularis,* cannot have been found in the recorded locality (Siboga Expedition, Stat. 225). The depths, from which material was collected in this Station, varied from 421 to 1811 meters, and as the vertical limit of distribution of the Fungids does not exceed 70 m, this statement must be incorrect.

In the Leyden Museum there is also a specimen of *Polyphyllia talpina,* labelled „Japan“ (cp. van der Horst 1921). This statement, however, needs fuither affirmation, for from this region no other Fungids have been recorded.

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Explanation of the Plates.

All figures are of natural size unless otherwise stated. Where no date is recorded the specimens are from the Danish Expedition to the Kei Islands 1922.

Plate V.

Figs. 1 and 2. *Fungia hexagonalis*, Banda, off Lontor, ca. 13 m. Upper and lower surface of a specimen in which a large number of buds have developed from the remainder of the living parts.

Fig. 3. A part of the margin of the same specimen. $\times$ 5.

Figs. 4 and 5. *Fungia hexagonalis*, Banda, off Neira, ca. 20 m. Upper and lower surface of a specimen with two calicles.

Figs. 6 and 7. *Fungia hexagonalis*, Banda, off Neira, ca. 20 m. Upper surface of irregularly regenerated specimens.

Fig. 8. *Fungia hexagonalis*, Banda, off Neira, ca. 20 m. Large bud, which has grown out from the remainder of the soft tissues on a dead portion of the corallum.

Fig. 9. *Fungia hexagonalis*, Banda, off Neira, ca. 20 m. Lateral view of a corallum with a false bud at the lower surface.

Fig. 10. *Fungia hexagonalis*, Banda, off Neira, ca. 20 m. Young bud which has developed from the remainder of the living tissues on a dead part of the corallum. $\times$ 2.

Fig. 11. *Fungia hexagonalis*, Banda, off Neira, ca. 20 m. Lateral view of a regenerated specimen with irregular protuberances and several secondary calicles at the upper surface.

Fig. 12. *Fungia patelliformis*, Koh Mesan, Siam, 27 m, Dr. Th. Mortensen leg. 1900. Lower surface of a specimen regenerated from a small wedge-shaped fragment.

Fig. 13. *Fungia patelliformis*, Stat. 19, 20 m. Upper surface of a specimen with lobate margin, preserved in alcohol. The cycles of tentacles are fairly well visible.

Fig. 14. *Fungia patelliformis*, Banda, off Lontor, 14 m. Fragment of a Diaseris-specimen.

Figs. 15 and 16. *Fungia laciniosa*, Banda, off Neira, 20—30 m. Upper surface of one specimen and lower surface of another.

Fig. 17. *Fungia laciniosa*, Banda, off Neira, 20—30 m. Upper surface of the smallest free anthocyathus. $\times 2^1/_2$.

Fig. 18. *Fungia fragilis*. Dr. Th. Mortensen's Pacific Expedition 1914—16, off Jolo, Sulu Islands, ca. 36 m. Lateral view of a Cycloseris-specimen of highly arched form preserved in alcohol.

Fig. 19. *Fungia fragilis*. Oral view of the same specimen.

Fig. 20. *Fungia vaughani*, Dr. Th. Mortensen's Pacific Expedition 1914—16, Honolulu, 18—72 m. Alcohol-specimen.

Fig. 21. *Fungia patelliformis*, Stat. 19, 20 m. Upper surface of a regenerated specimen preserved in alcohol.

Fig. 22. *Fungia marginata*, Banda, off Lontor, ca. 13 m. Regenerated specimen with buds.

Fig. 23. *Fungia laciniosa*, Banda, off Neira, 20—30 m. Oral view of a stalked anthoblast. $\times 5$.

Fig. 24. *Fungia cyclolites*, Banda, off Neira, 20—25 m. Side view of a specimen with strongly elevated central part.

Plate VI.

Figs. 25, 27, 29, 31, 33, 35 and 37. *Fungia cyclolites*, Gelala, Amboina, 0—2 m. Upper surface of broken fragments regenerating into the Cycloseris-form.

Figs. 26, 28, 30, 32, 34, 36 and 38. Lower surface of the same specimens.

Fig. 39. *Fungia cyclolites*, Gelala, Amboina, 0—2 m. Side view of anthoblast.

Figs. 40, 41 and 42. (Fig. 41 is the small specimen to the left of fig. 42). *Fungia cyclolites*, Amboina, 12—18 m. Upper and lower surface of three fragments of the Diaseris-form.

Figs. 43 and 44. Upper and lower surface of the specimen represented in fig. 41. $\times 3^1/_2$.

Fig. 45. *Fungia cyclolites*, Gelala, Amboina, 0—2 m. A dead portion of the margin is overgrown by new formed parts.

Fig. 46. *Fungia cyclolites*, Gelala, Amboina, 0—2 m. Specimen with two calicles.

Fig. 47. *Fungia cyclolites*, Gelala, Amboina, 0—2 m. Oral view of stalked anthoblast. $\times 5$.

Fig. 48. *Fungia cyclolites*. Gelala, Amboina, 0—2 m. A number of secondary calicles have developed between the primary calicle and the margin of the corallum.

Fig. 49. *Fungia moluccensis*, Banda, N. of Goenoeng Api, ca. 10 m. Lower surface of a young specimen with lateral bud.

Fig. 50. *Fungia marginata*, Banda, N. of Goenoeng Api, ca. 10 m. Lower surface with a false bud.

Fig. 51. *Fungia marginata*, Banda, N. of Goenoeng Api, ca. 10 m. Upper surface of a very thick specimen.

Figs. 52 and 53. *Fungia marginata*, Banda, off Lontor, ca. 13 m. Specimens with buds that have grown out from the remainder of the living tissues.

Fig. 54. *Fungia marginata*, Banda, off Lontor, ca. 20 m. Part of the margin of a dead specimen with buds. $\times$ 5.

Figs. 55—63. *Fungia distorta*, Banda, N. of Goenoeng Api, ca. 9 m. Specimens preserved in alcohol.

Fig. 64. *Fungia distorta*, Banda, N. of Goenoeng Api, ca. 9 m. First traces of regeneration on a fragment.

Fig. 65. *Fungia somervillei*, Dr. Th. Mortensen's Pacific Expedition 1914—16, Off Jolo, Sulu Islands, ca. 45 m.

Plate VII.

Figs. 66 and 67. *Fungia echinata*, Banda, 0—25 m. Upper and lower surface of a small specimen.

Figs. 68 and 69. *Herpolitha simplex*, Banda, off Lontor, 14 m. Upper and lower surface of a specimen in which the axial fossa has divided into four parts.

Fig. 70. *Herpolitha simplex*. Part of the lower surface of the type-specimen.

Figs. 71 and 72. *Fungia echinata*, Banda, off Neira, ca. 20 m. Stalked anthoblast, lateral and oral view.

Fig. 73. *Fungia fungites*, Doelah laut, Kei Islands, reef. $^4/_5$ nat. size.

Fig. 74. *Fungia repanda*, Banda Lontor, reef. Broken specimen with the first traces of regeneration.

Fig. 75. *Fungia moluccensis*, Banda, 0—25 m. Side view of the central part of a specimen with secondary calicles.

Fig. 76. *Fungia moluccensis*, Banda, 0—25 m. Oral surface of a specimen with a great many secondary calicles. About $^2/_3$ nat. size.

Fig. 77 *Fungia paumotensis*, Doelah laut, Kei Islands, reef. Lower surface of a specimen with broad spines.

Plate VIII.

Figs. 78—85. *Herpolitha limax*, Banda, off Neira, 20—30 m. Upper and lower surface of four young anthoblasts. Only in one specimen (figs. 80, 81) the axial fossa has divided into secondary calicles.

Figs. 86 and 87. *Polyphyllia talpina*, Banda, Lontor Channel, ca. 25 m.

Figs. 88 and 89. *Polyphyllia talpina*, Banda, off Neira, ca. 25 m.

Figs. 90 and 91. *Polyphyllia talpina*, Banda, off Goenoeng Api, 1—2 m. Anthocyathus of the stalked anthoblast represented in fig. 92.

Fig. 92. *Polyphyllia talpina*, Banda, off Goenoeng Api, 1—2 m. Stalked anthoblast.

Figs. 93—96. *Halomitra philippinensis*, Banda, Lontor Channel, slope of Goenoeng Api, ca. 25 m. Upper and lower surface of two small regenerating fragments.

Figs. 97 and 98. *Halomitra philippinensis*. Banda, 0—25 m Young specimen with only very few secondary calicles.

Fig. 99. *Halomitra robusta*, Banda, off Neira, 20—25 m. Side view of stalked anthoblast.

Figs. 100—103. *Halomitra robusta*, Banda, off Goenoeng Api, 11—25 m. Upper and lower surface of two young anthoblasts.

Fig. 104. *Halomitra robusta*, Banda, 0—25 m. Part of the upper surface of the specimen represented in fig. 116.

Plate IX.

Fig. 105. *Halomitra philippinensis*, Banda, off Goenoeng Api, ca. 2 m. Arched specimen with more or less concentric rows of secondary calicles. $\times \frac{1}{8}$.

Fig. 106. *Halomitra philippinensis*, Amboina, 0—2 m. $\times \frac{1}{8}$.

Fig. 107. *Halomitra robusta*, Amboina, 0—2 m. Side view of a regularly arched specimen. $\times \frac{1}{6}$.

Fig. 108. *Halomitra robusta*, Banda, 0—25 m. Flat specimen with upturned marginal part. About $\frac{1}{4}$ nat. size.

Fig. 109. *Polyphyllia talpina*, Banda, 0—25 m. Long and narrow specimen in which the calicles of the axial fossa are clearly to be distinguished. $\times \frac{1}{6}$.

Fig. 110. *Polyphyllia talpina*, Amboina, 0—2 m. A large specimen of the usual shape. $\times \frac{1}{6}$.

Fig. 111. *Halomitra philippinensis*, Banda, off Goenoeng Api, ca. 25 m. Side view of highly arched specimen. $\times \frac{1}{8}$.

Fig. 112. *Halomitra robusta*, Doelah laut, Kei Islands, reef. Very regular specimen. $\times \frac{1}{8}$.

Fig. 113. *Halomitra robusta*, Banda, 0—25 m. Large flat specimen with irregularly developed marginal part. About $\frac{1}{5}$ nat. size.

Fig. 114. *Halomitra robusta*, Banda, 0—25 m. Flat specimen. $\times \frac{1}{3}$.

Figs. 115 and 116. *Halomitra robusta*, Banda, 0—25 m. Specimens with very small septal dentations. $\times \frac{2}{7}$.

Fig. 117. *Herpolitha limax*, Banda, off Goenoeng Api, 0—2 m. Lower surface of a large regenerated specimen with a bud. $\times \frac{1}{3}$.

Figs. 118 and 119. *Halomitra philippinensis*, Banda, 0—25 m. Upper and lower surface of a comparatively flat specimen found upside down. $\times \frac{2}{9}$.

Fig. 120. *Halomitra robusta*, Banda, 0—25 m. Lower surface of a specimen found upside down. $\times \frac{1}{5}$.

Fig. 121. *Halomitra philippinensis*. Lower surface of the specimen represented in fig. 111. $\times \frac{2}{5}$.

Fig. 122. *Halomitra robusta*, Banda, 0—25 m. Arched specimen. $\times \frac{2}{7}$.

Plate X.

Fig. 123. *Halomitra echinatus*, Banda, 0—25 m. Upper surface of a large regenerated colony.

Fig 124. *Halomitra echinatus.* Part of the lower surface of the same colony.

Fig. 125. *Halomitra echinatus.* Part of the lower surface of the same colony. $\times$ 5.

Fig. 126. *Fungia echinata*, Amboina, 0—2 m. A portion of the lower surface of a specimen with a lateral bud in the neighbourhood of a dead part.

Fig. 127. *Halomitra philippinensis*, Banda, Lontor Channel, ca. 25 m. Lower surface of a regenerated slightly arched specimen with a large bud. $\times$ $^1/_5$.

Fig. 128. *Fungia moluccensis.* A part of the lower surface of the specimen represented in fig. 76.

Fig. 129. *Halomitra philippinensis,* Banda, 0—25 m. A part of the lower surface of a colony. $\times$ 5.

Fig. 130. *Halomitra robusta,* Banda, off Goenoeng Api, 0—2 m. First stage of the formation of a false bud. $\times$ $^1/_3$.

Fig. 131. The bud of fig. 130 in natural size.

Fig. 132. *Halomitra robusta*, Banda, 0—25 m. Further stage of the formation of a false bud. $\times$ $^1/_3$.

Fig. 133. *Halomitra robusta*, Banda, Lontor Channel, ca. 10 m. Specimen with a large false bud. $\times$ $^1/_3$.

Plate XI.

Fig. 134. *Halomitra echinatus*, Fiji Isl., U. S. Exploring Exp., U. S. National Museum, Washington. Probably the type-specimen of *Zoopilus echinatus* Dana. Lower surface. Natural size.

Fig, 135. *Halomitra echinatus.* Upper surface of the same specimen. Natural size.

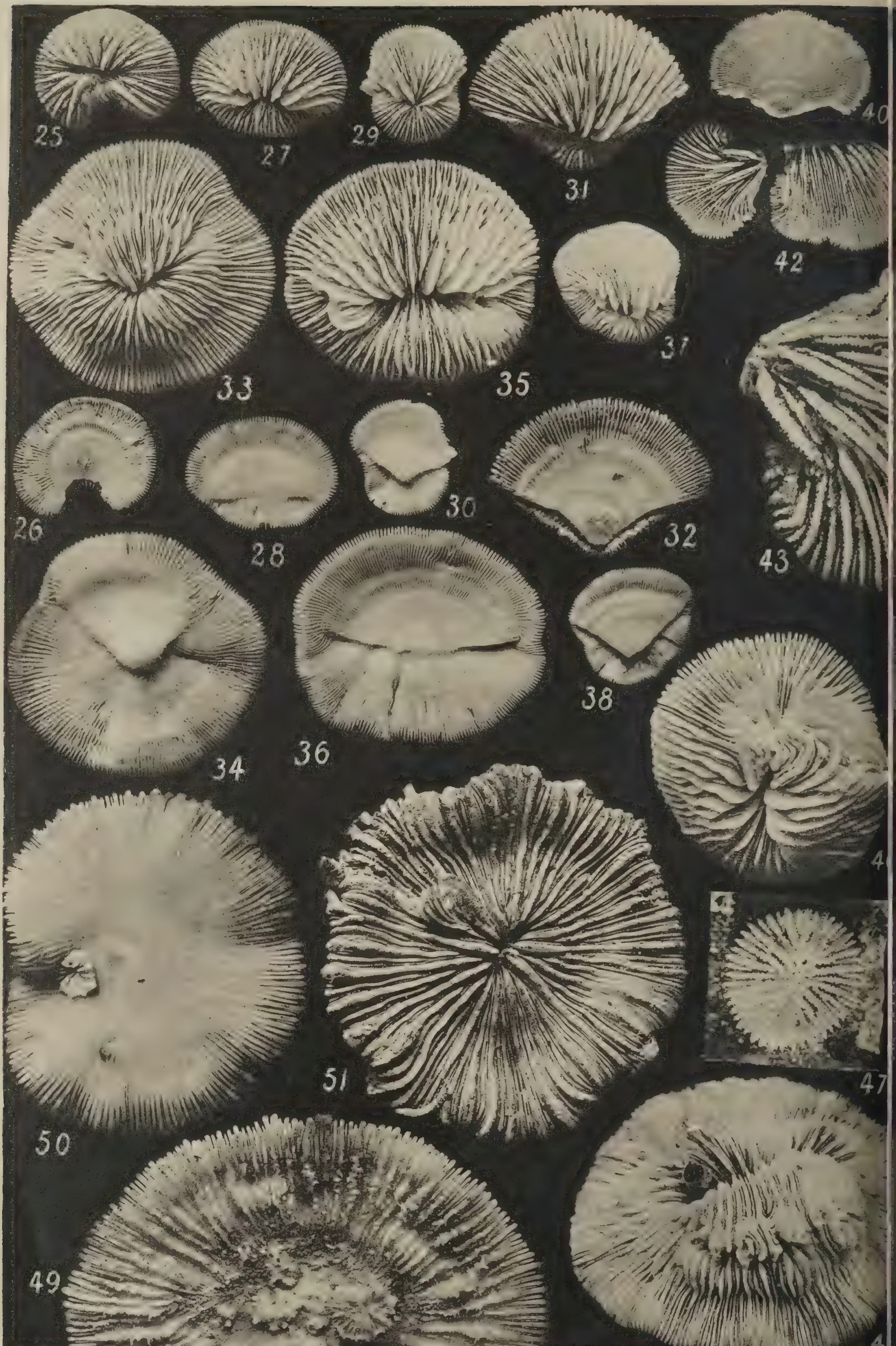
Fig. 136. *Fungia tenuis* Dana. Pacific Ocean, probably Paumotu Arch. U. S. Exploring Exp., U. S. National Museum, Washington. Lower surface. Probably the type-specimen. Natural size.

Fig. 137. *Fungia tenuis* Dana. Upper surface of the same specimen. Natural size.

The figures of Pl. XI are after photographs made in the United States National Museum in Washington, and are not, as erroneously stated on the plate, made by the author.

Photogr. H. Boschma.

Imp. Catala frères, Paris.



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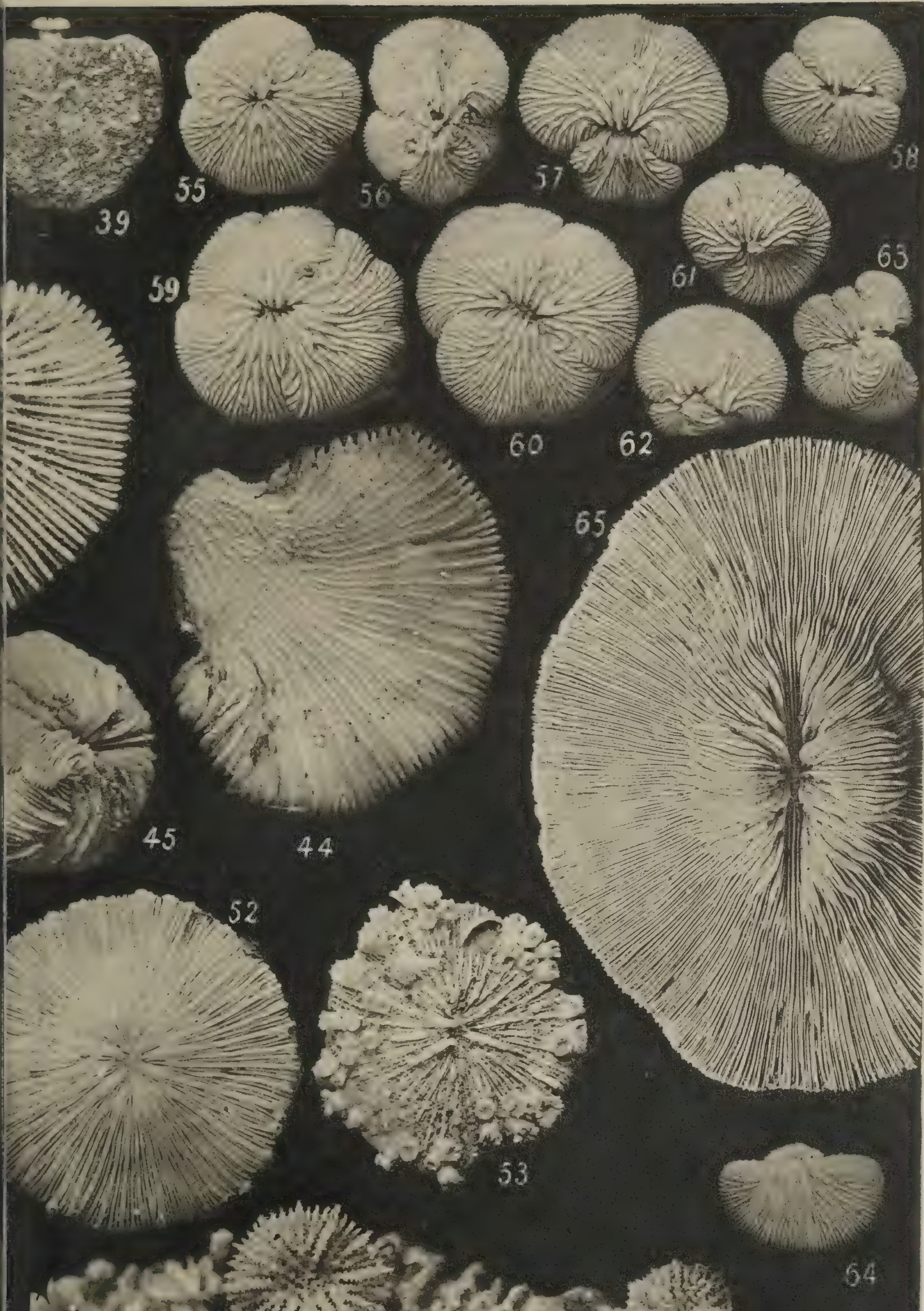

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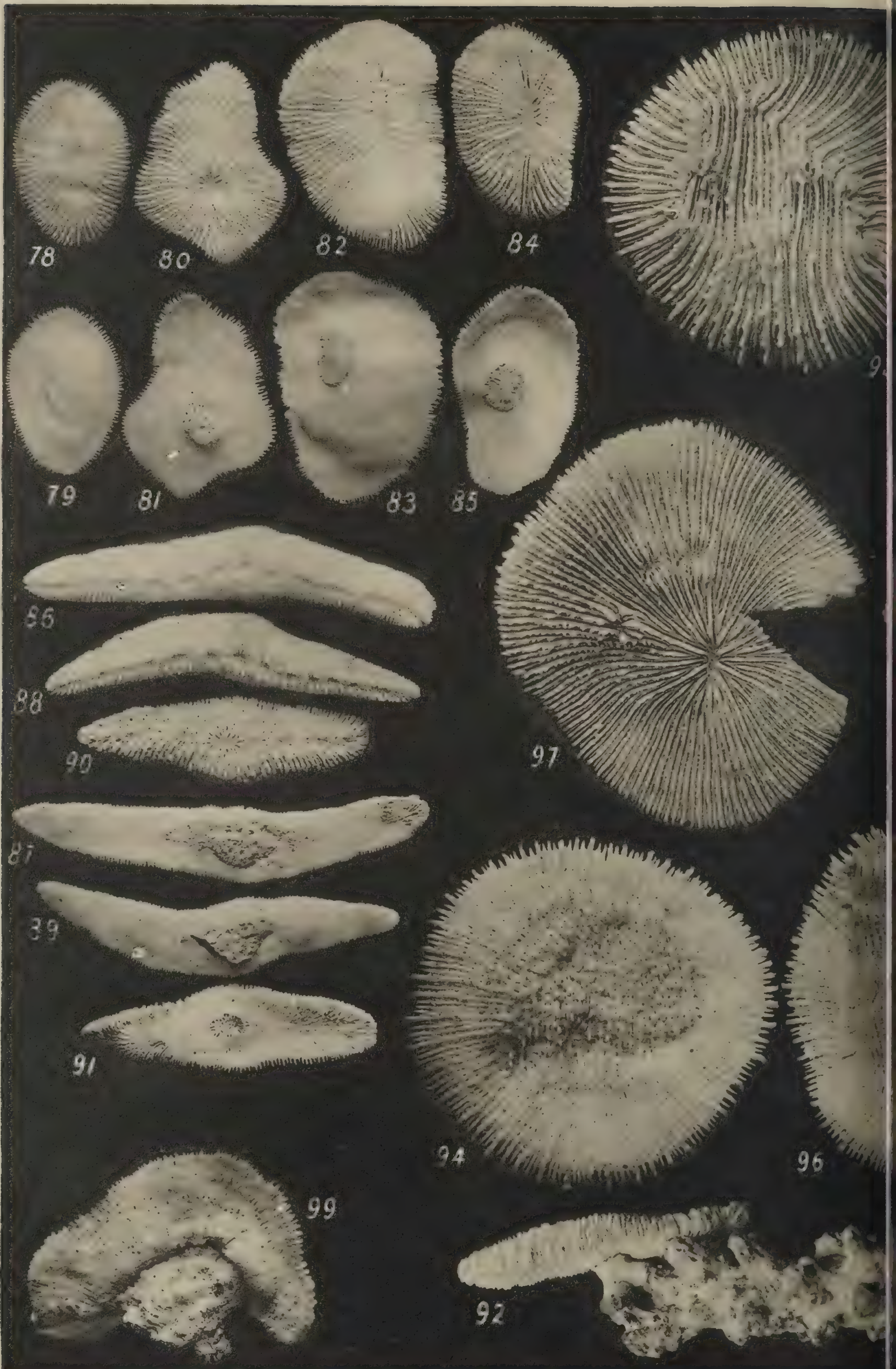
Photogr. H. Boschma.

Imp. Catala frères, Paris.



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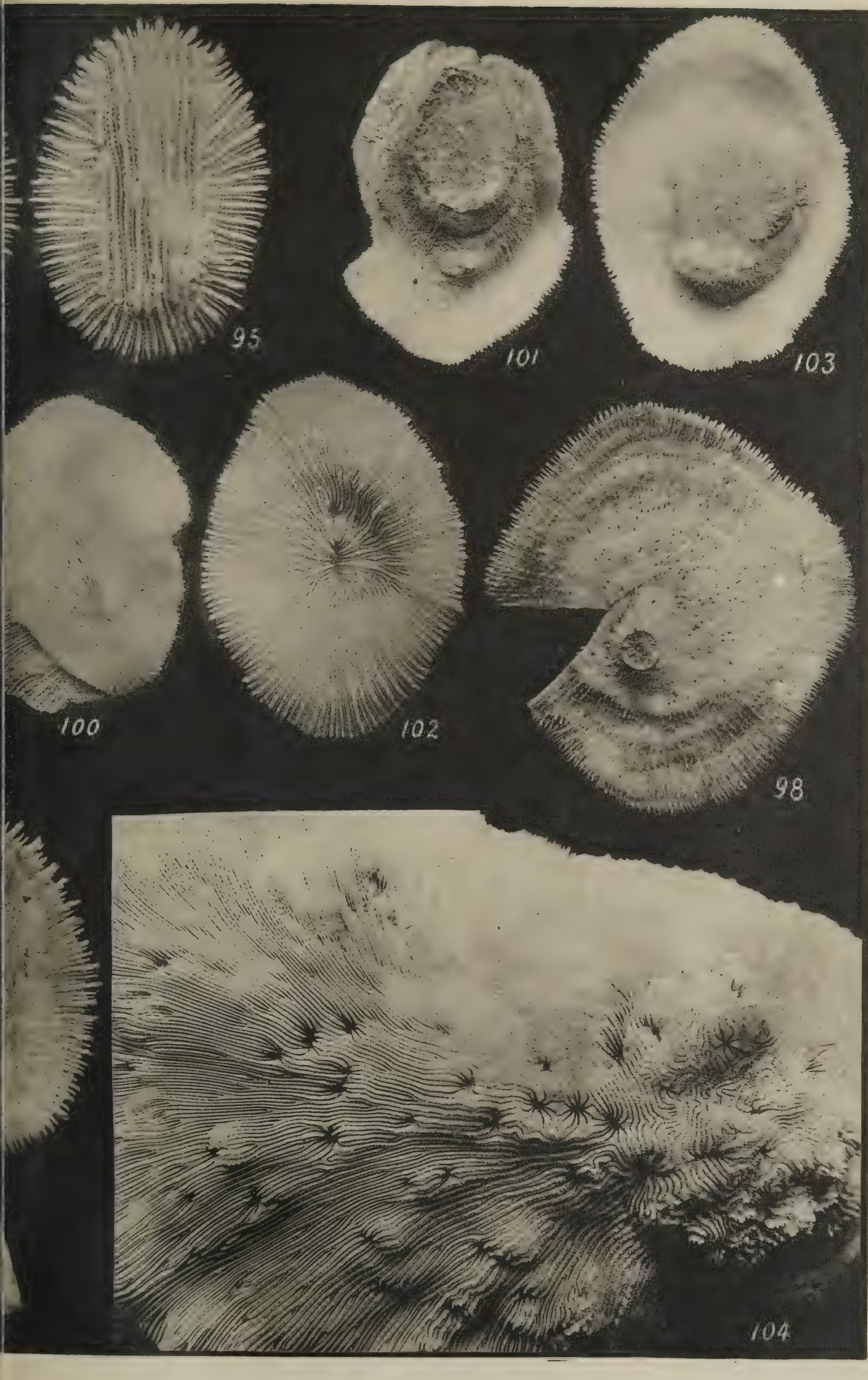

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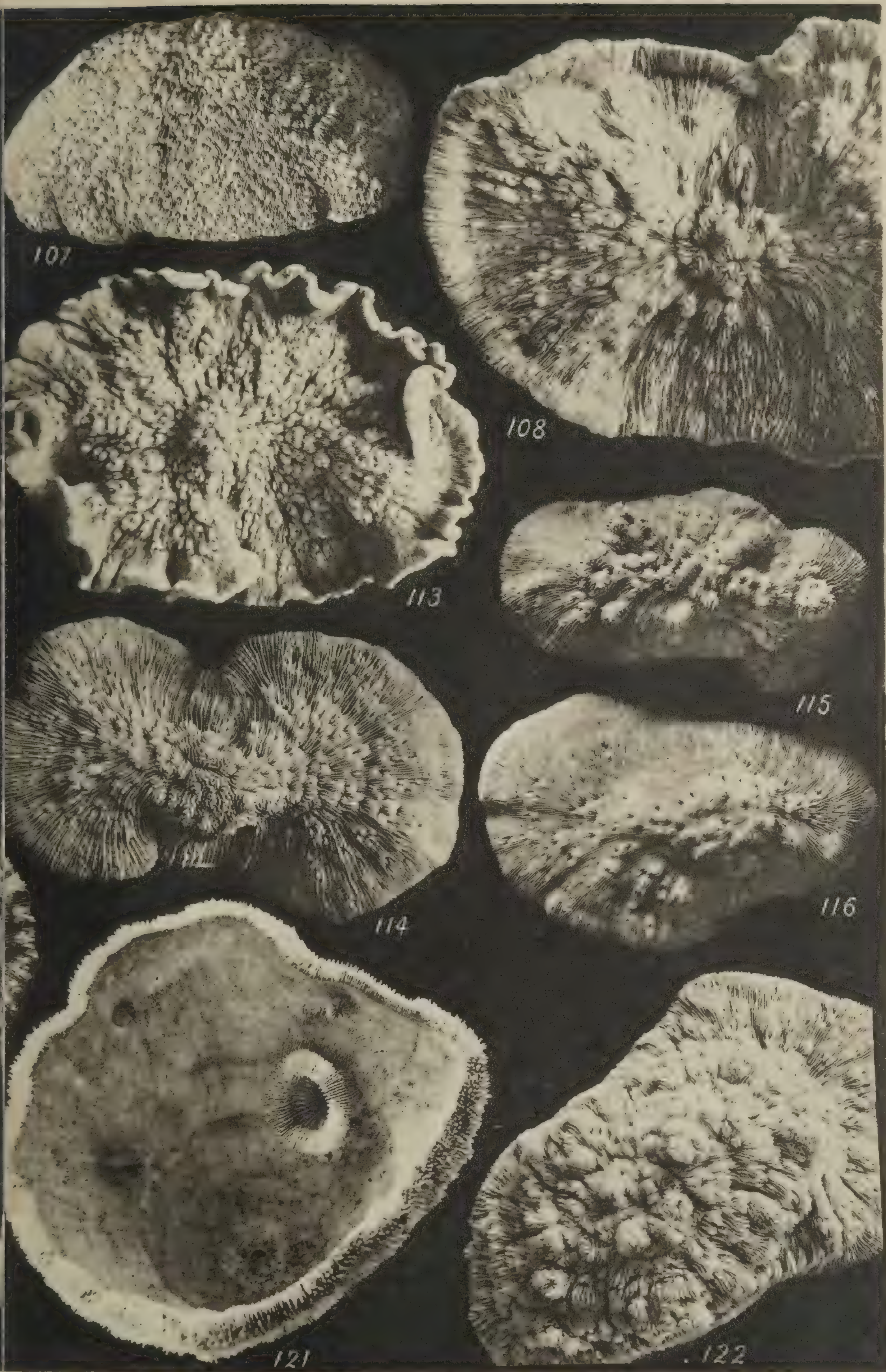

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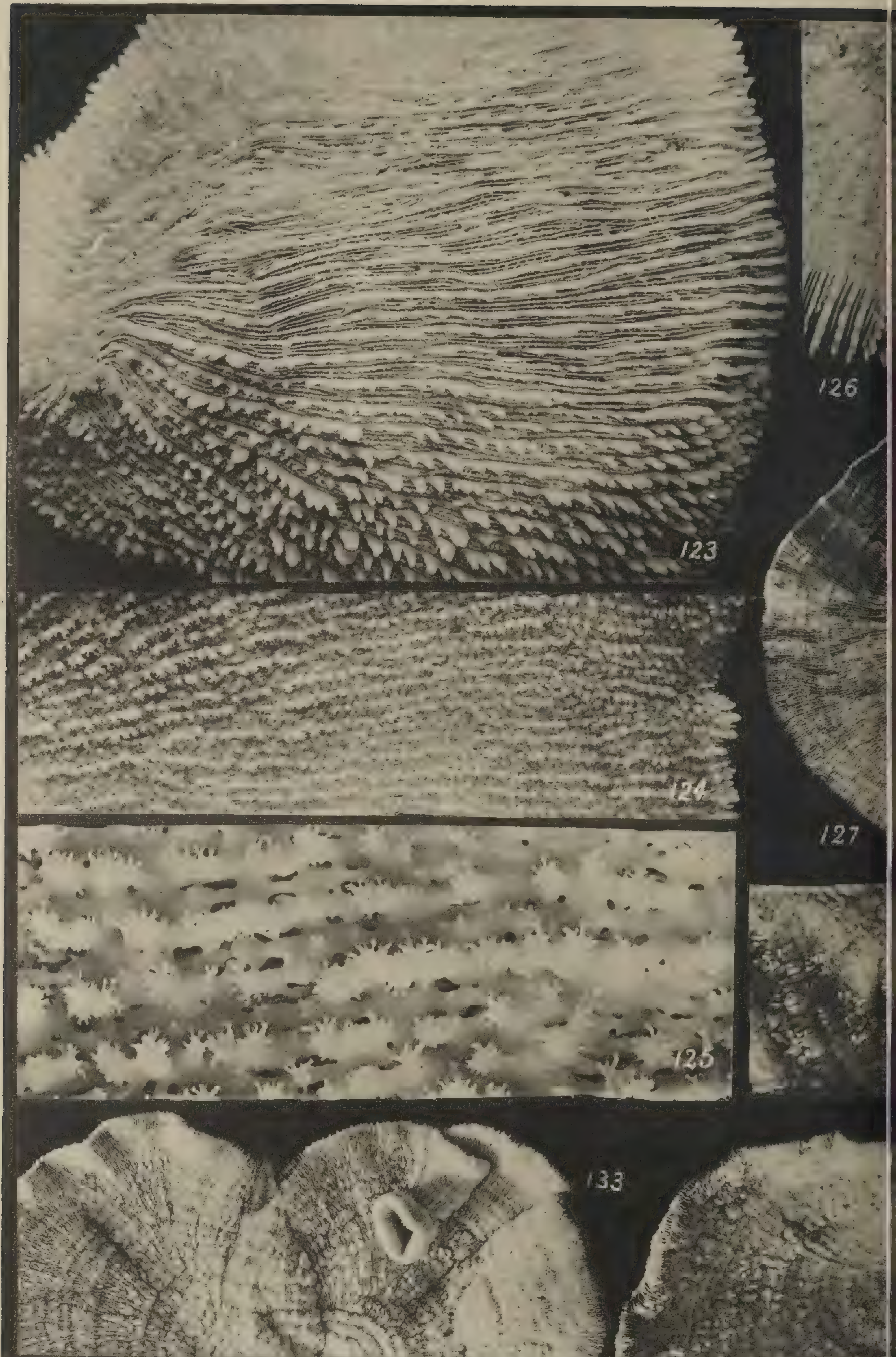

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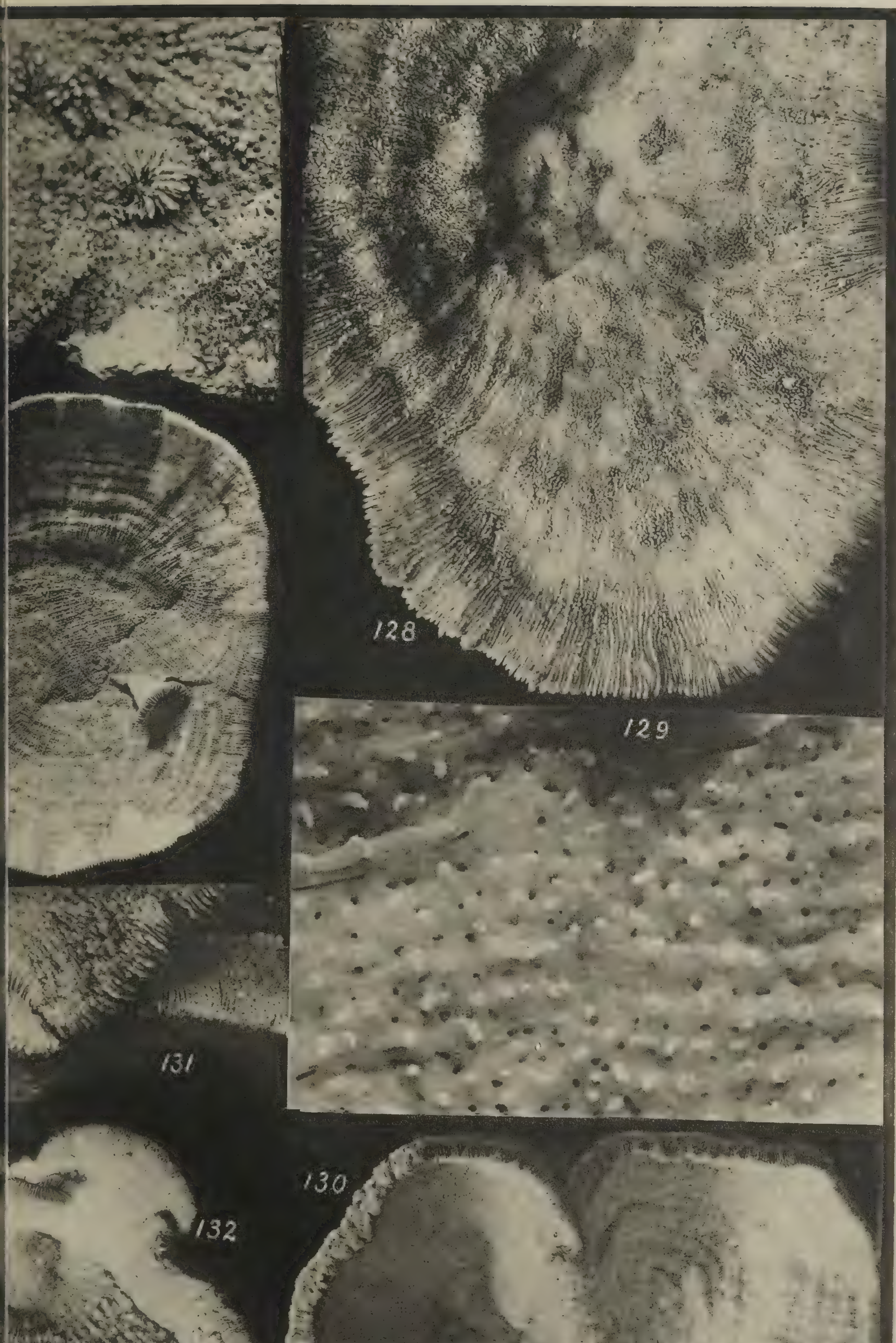

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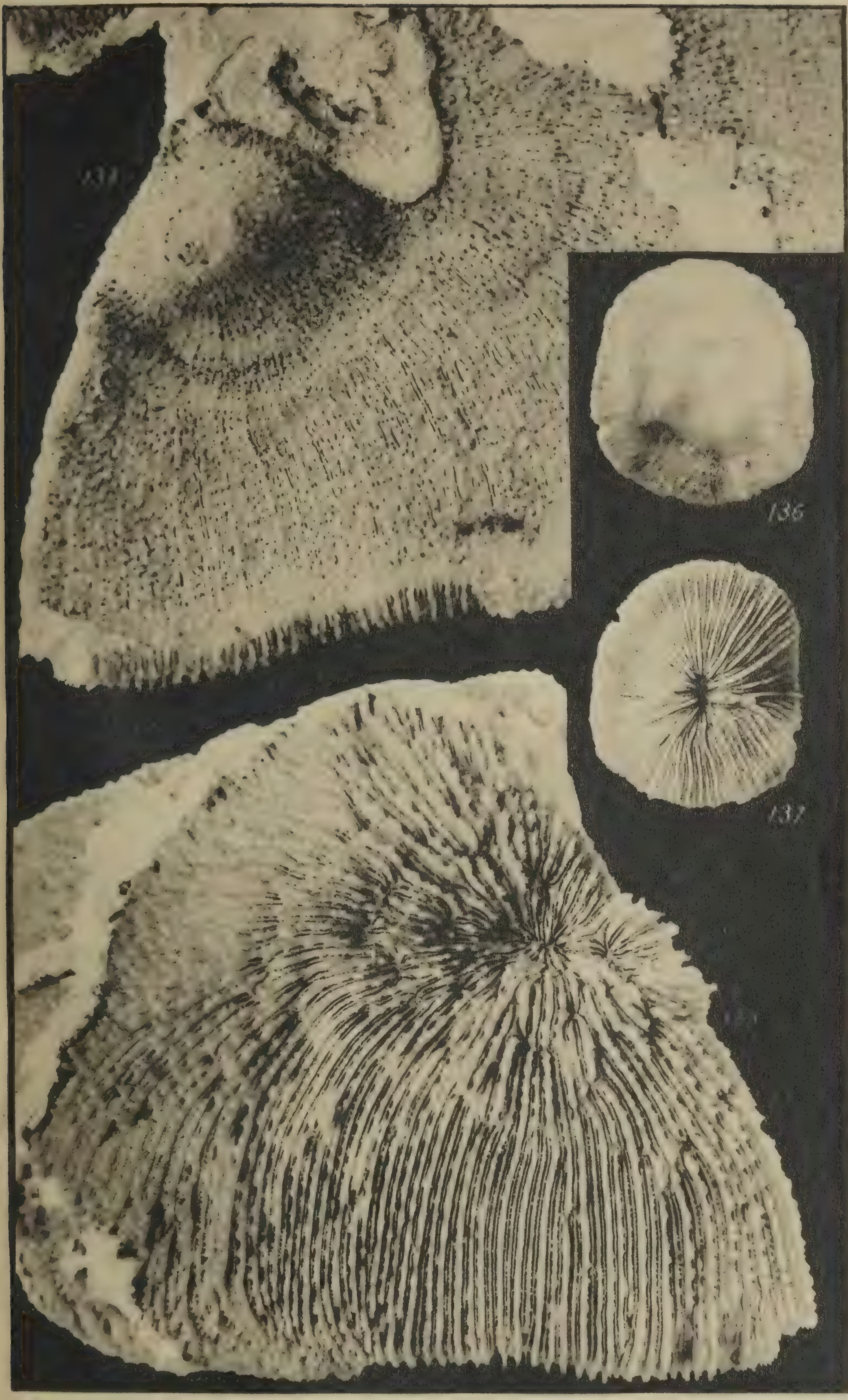

Photogr. H. Boschma. Imp. Catala frères, Paris.

Papers from Dr. Th. Mortensen's Pacific Expedition 1914—16.

XXIX.

Echinoderms of New Zealand and the Auckland-Campbell Islands.

III—V. Asteroidea, Holothurioidea and Crinoidea.

By

Dr. **Th. Mortensen.**

(With Pls. XII—XIV).

III. Asteroidea.

The first seastar to be recorded from New Zealand was *Astrogonium miliare*, described by Gray in 1847 [1]). The second was *Stephanaster elegans*, described by Ayres in 1851 [2]), which proved, however, to be identical with *Pentagonaster pulchellus* Gray. This species was described already in 1840 [3]), Gray giving, however, — doubtlessly on account of an incorrect label — China as the locality. These two species were the only ones known from New Zealand until Verrill in 1867 [4]) published the description of four new species of seastars from there, viz. *Coelasterias australis, Coscinasterias muricata, Asterina (Asteriscus) regularis* and *Astropecten Edwardsi.*

In his "Catalogue of the Echinodermata of New Zealand" 1872 Hutton describes the following four new species: *Asterias mollis, Margaraster (?) scaber, Astrogonium rugosum* and *Pteraster inflatus;* also a new variety of *Pentagonaster pulchellus* is described. Three

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2) W. O. Ayres. Stephanaster elegans. Proc. Boston Soc. Nat. Hist. IV. 1851. (1854); p. 118.

3) J. E. Gray. Synopsis of the genera and species of the class Hypostoma (Asterias Linn.). Ann. Mag. Nat. Hist. VI. 1840; p. 280.

4) A. E. Verrill. Notes on the Radiata in the Museum of Yale College. No. 1. Descriptions of new Starfishes from New Zealand. Trans. Connect. Acad. Sci. I. 1867; p. 247.

more species are recorded as new to the New Zealand fauna: *Astropecten armatus* Gray (?), *Henricia occulata* Penn. and *Othilia luzonica* Gray. The latter species is included in the New Zealand fauna on the apparent authority of Gray, who in his "Synopsis of the species of Starfish in the British Museum" 1866, p. 12, quotes from Müller & Troschel's "System der Asteriden" *Echinaster eradanella* (sic!) with the locality New Zealand. This is, however, simply a lapsus calami on the part of Gray, as Müller & Troschel have only the locality "Neu Irland" for the said species. (The species *eridanella* and *luzonicus* appear to be synonyms only of *Ech. purpureus*).

In 1875 E. Perrier[1]) describes two new species of seastars from New Zealand, viz. *Pentagonaster dilatatus* and *Asterina novæ-zelandiæ,* while *Asterina Gunnii* Gray is recorded from New Zealand; it is also stated under *Pentagonaster australis* (Gray) (Op. cit. p. 200) that there are three specimens of this species in the collection Michelin "designés avec doute comme provenant de la Nouvelle-Zélande". As this species has not since been recorded from New Zealand, the label doubtlessly was incorrect. Perrier further states that Verrill's *Coelasterias australis* belongs to the genus *Stichaster* M. & Tr., that his *Coscinasterias muricata* is the same as *Asterias calamaria* Lamk., and that Hutton's *Pteraster inflatus* belongs to the genus *Palmipes* Linck.

Hutton in 1878[2]) adds four species to the New Zealand fauna of seastars, viz. *Asteracanthion graniferus* Lamk., *Asterias rupicola* Verr., *Echinaster (?)* sp. and *Chætaster maculatus* Gray; in the same paper he states the *Henricia occulata* of his Catalogue to be *Echinaster fallax* M. & Tr., which is again the same as *Othilia luzonica* Gray. Further in 1879[3]) he describes a seastar from the Auckland Isl. under the name of *Asterias rupicola* Verr., var. *lævigata.*

[1]) E. Perrier. Révision de la collection de Stellérides du Muséum d'histoire naturelle de Paris. 1875. (Arch. de Zool. expér. & génér. IV—V. 1875—76). — In the quotations of this paper in the following the page numbers refer to the separate copy.

[2]) F. W. Hutton. Notes on some New Zealand Echinodermata, with descriptions of New Species. Trans. N. Z. Inst. XI. p. 305;

[3]) F. W. Hutton. Notes on a collection from the Auckland Islands and Campbell Island. Ibidem. p. 343.

In his report on the zoological collections made at Campbell Island during the Transit of Venus-Expedition in 1874 H. Filhol[1]) mentions only two species of seastars from there, viz. *Cribrella ornata* Perrier and *Ophidiaster Campbelli.* The latter is only a nomen nudum. Dr. L. Germain kindly informs me that there is no specimen thus labelled in the Muséum d'histoire naturelle, Paris, whereas there is a specimen labelled *Cribrella campbellensis.* This specimen having been sent me, I find it to be a typical specimen of *Henricia lukinsii* (Farquhar), thus, indeed, the same as the *Cribrella ornata* mentioned by Filhol. Howsoever Filhol came to the name *Ophidiaster Campbelli,* it is — like *Cribrella campbellensis* — a nomen nudum, to be left out of consideration.

Sladen, in his "Challenger" Asteroidea records *Choriaster granulatus* Ltk. and *Metrodira subulata* Gray from New Zealand; although also W. K. Fisher in his "Starfishes of the Philippine Seas" (1919) gives New Zealand under the localities of these two species, it may be regarded as fairly certain that they do not occur in New Zealand seas, these statements resting, evidently, on old unreliable Museum-labels[2]).

Not counting some deep-water species taken off New Zealand by the "Challenger" and the "Gazelle", the next addition to the Asteroid fauna of New Zealand is due to de Loriol, who in 1894[3]) describes a new species, *Stichaster Suteri,* which had been collected and sent him by Suter.

From the following year until 1909 the increase of our knowledge of the New Zealand Asteroid fauna is due exclusively to H. Farquhar, who in a series of important papers has described several new species, corrected mistakes in older identifications and, upon the whole, done a highly meritorious work in extending

[1]) H. Filhol. Recueil de Mémoires, Rapports et Documents ..... Passage de Vénus sur le Soleil. III. Mission île Campbell. Chapitre X. Échinodermes p. 572.

[2]) In the Index Faunæ Novæ Zealandiæ *Ophidiaster cylindricus* (Lmk.) is enumerated among the New Zealand Asteroidea on the authority of Sladen, Challenger-Asteroidea. However, Sladen gives as the only locality of this species Kandavu, Fiji Islands. It is thus by mistake that *Oph. cylindricus* is included in the list of New Zealand sea-stars.

[3]) P. de Loriol. Notes pour servir à l'Étude des Échinodermes. IV. Rev. Suisse de Zoologie. II. 1894. p. 477.

our knowledge of the New Zealand Echinoderm fauna. In 1895 [1]) he describes the new species *Stichaster insignis*, *Stichaster littoralis* and *Tarsaster neozelanicus*; the latter he recognizes in his next paper, 1897 [2]) as identical with *Stichaster polyplax* Müll. & Trosch., *Stichaster littoralis* is stated to be the same as de Loriol's *Stichaster Suteri*, the description of the latter, published almost contemporaneously with Farquhar's paper being naturally unknown to Farquhar by that time; finally Hutton's *Astrogonium pulchellum*, Var. B. is referred to *Astrogonium abnormale* Gray. In the same year, 1897, Farquhar describes [3]) the new species *Cribrella lukinsii*, while Hutton's *Henricia occulata* is identified with *Cribr. compacta* Sladen. He also mentions a specimen of *Cribrella ornata* Perr. from the Snares Isl., different from the *Cr. ornata* of Filhol *(= H. lukinsii)*.

In the following publication, 1898 [4]), Farquhar gives only a compilation of all the species of seastars (a. o. Echinoderms) known — or recorded — from New Zealand up to that time. In 1907 [5]) he shows Hutton's *Astrogonium rugosum* to be the same as Gray's *Astrog. miliare*, in 1909 [6]) he describes a new variety, *reischeki*, of *Ast. calamaria*, and finally in 1913 [7]) be publishes the description of one of the finest starfishes in existence: *Eurygonias hylacanthus*, known till now only in one single specimen, found off Wellington.

In his report on the Echinoderma collected by the New Zealand Governm. Trawling Expedition in 1907 [8]) Benham increases our knowledge of the New Zealand Asteroid fauna very considerably; he describes two new species, *Mediaster Sladeni* and *Echinaster Far-*

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[1]) H. Farquhar. Notes on New Zealand Echinoderms. Trans. N. Z. Inst. XXVII. 1894 (1895).

[2]) H. Farquhar. A contribution to the History of New Zealand Echinoderms. Journ. Linn. Soc. Zoology. XXVI. 1897.

[3]) H. Farquhar. Notes on New Zealand Starfishes. Trans. N. Z. Inst. XXX. 1897.

[4]) H. Farquhar. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales. 1898.

[5]) H. Farquhar. Notes on New Zealand Echinoderms; with description of a new species. Trans. N. Z. Inst. XXXIX.

[6]) H. Farquhar. Further Notes on New Zealand Starfishes. Ibidem. XLI.

[7]) — On two new Echinoderms. Ibidem. XLV.

[8]) Records of the Canterbury Museum. I.2. 1909.

quhari and records as new to the New Zealand fauna *Psilaster acuminatus* Sl. (hitherto known only from deeper water), an unidentified *Luidia* sp. and *Odontaster Grayi* Bell. Hutton's *Uniophora (Asteracanthion) granifera* Lamk. is stated to be a misidentification. In the same year he records *Asterina fimbriata* Perrier from the Auckland Islands [1]), likewise a new addition to the New Zealand fauna; on the other hand he restricts the number of species of New Zealand Asteroids, declaring *Cribrella lukinsii* Farquhar to be the same as *Henricia ornata* (Perrier).

The last author to contribute to the New Zealand fauna of seastars is Koehler, who in 1911 [2]) describes a new species, *Goniodon angustus*, and further, in his report on the Asteroidea of the Australasian Antarctic Expedition, 1920, declares the *Asterina* from the Auckland Islands, which Benham identified as *Asterina fimbriata* Perr., to be a new species, *Asterina aucklandensis*.

In the present paper 6 new species are described, viz. *Astropecten dubiosus, A. primigenius, Luidia varia, L. neozelanica* (— the *Luidia* sp. of Benham), *Peridontaster Benhami* (— the *Odontaster Grayi* of Benham), *Nectria pedicelligera*, and a new variety of *Henricia compacta*, var. *aucklandiæ*; besides, two varieties, a and b, of *Asterina regularis* are described. One species, *Ophidiaster kermadecensis* Benham is recorded as new to the New Zealand fauna; on the other hand three are eliminated as synomyms only, viz. *Astropecten Edwardsi* Verr. (Syn. of *Astrop. polyacanthus), Pentagonaster abnormalis* Gray (Syn. of *P. pulchellus)* and *Goniodon angustus* Koehler (Syn. of *Goniodon dilatatus).*

The corrected list of New Zealand Asteroids, not including those known only from the Kermadec Islands or from the Deep-Sea off New Zealand, then looks as follows, in modern nomenclature.

1. **Astropecten polyacanthus** Müll. & Troschel *(= Astropecten Edwardsi* Verrill)
2. „ **dubiosus** n. sp.
3. „ **primigenius** n. sp.

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[1]) Subantarctic Islands of New Zealand. 1909. Art. XIII. Echinoderms, other than Holothurians.

[2]) R. Koehler. Description de quelques Astéries nouvelles. Rev. Suisse de Zool. 19. 1911.

4. **Psilaster acuminatus** Sladen.
5. **Luidia varia** n. sp.
6. „ **neozelanica** n. sp,
7. **Pentagonaster pulchellus** Gray (= *Pentagonaster abnormalis* Gray; *Stephanaster elegans* Ayres).
8. **Diplodontias dilatatus** (E. Perrier) (= *Goniodon angustus* Koehler)
9. **Asterodon miliaris** (Gray) (= *Astrogonium rugosum* Hutton)
10. **Mediaster Sladeni** Benham
11. **Peridontaster Benhami** n sp. (non *Odontaster Grayi* Bell)
12. **Eurygonias hylacanthus** Farquhar
13. **Nectria pedicelligera** n. sp.
14. **Ophidiaster kermadecensis** Benham.
(*Ophidiaster cylindricus* (Lmk.) — not New Zealand)
(*Metrodira subulata* Gray — not New Zealand)
(*Chætaster maculatus* Müll. & Trosch. = *Nepanthia maculata* Gray — not New Zealand)
(*Choriaster granulatus* Ltk. — not New Zealand)
15. **Asterina (Patiriella) regularis** Verrill
? „ „ *Gunnii* Gray
? „ *(Patiria) novæ-zelandiæ* Perrier
16. „ **(Asterinopsis) aucklandensis** Koehler (non = *Asterina fimbriata* Perrier)
17. **Stegnaster inflatus** (Hutton)
18. **Echinaster Farquhari** Benham
? *Echinaster purpureus* Gray
19. **Henricia lukinsii** (Farquhar)
20. „ **compacta** (Sladen)
21. „ „ var. **aucklandiæ** n. var. (non = *Henricia ornata* Perrier)
22. **Calvasterias Suteri** (de Loriol) (= *Stichaster littoralis* Farquhar; *Asterias rupicola* Hutton, non Verrill)
23. „ **lævigata** (Hutton)
24. **Stichaster australis** (Verrill)
25. **Allostichaster polyplax** (Müll. & Trosch.) (= *Tarsaster neozelanica* Farquhar)
26. „ **insignis** (Farquhar)
27. **Sclerasterias mollis** (Hutton)

28. **Astrostole scabra** (Hutton)
(*Uniophora granifera* Lmk. — not New Zealand)
29. **Coscinasterias calamaria** (Gray) (= *Coscinasterias muricata* Verrill; *Asterias calamaria*, var. *reischeki* Farquhar)

The Index Faunæ Novæ Zelandiæ (1904) records 31 species of seastars as belonging to the New Zealand fauna, against which the number of species recorded here, 29, apparently does not stand out very favourably. An analysis of the list in the Index, however, alters the result considerably in favour of the present list. Among the species enumerated in the Index four *(Solaster torulatus, Cribrella sufflata, Freyella polycnema* and *Asterias fragilis)* are Deep-Sea forms, and two *(Asteropsis imperialis* and *Asterias rodolphi)* are known only from the Kermadec Islands; these do not concern us here. Four species *(Ophidiaster cylindricus, Asterina novæ-zelandiæ, Echinaster purpureus* and *Uniophora granifera)* do not belong to the New Zealand fauna or are, at least, not known with certainty from there, and three (*Astropecten Edwardsi, Astrogonium abnormale* and *Gnathaster rugosus)* are synonyms only. Thus reduced the list of the Index really contains only 18 species of sea-stars actually known from New Zealand. The present list of 29 species known with certainty from the New Zealand seas thus represents quite a considerable addition to our knowledge of the New Zealand fauna. That the list will ultimately be not inconsiderably increased I do not doubt. Especially the sea to the North of New Zealand may well be expected to yield a rich harvest, and also in the Cook Strait we may expect to meet with species not yet recorded from New Zealand. Even the littoral fauna may yield surprises, as exemplified by the find of the single specimen of *Nectria pedicelligera*. A species of *Echinaster* is stated by Farquhar (Tr. N. Z. Inst. XVII, p. 202) to be found sometimes at low water on the rocks of Lyall Bay and Island Bay in December and January, which would appear to be an undescribed species. Questionable is still the occurrence on New Zealand Coasts of the two Asterinas, *A. Gunnii* and *novæ-zelandiæ*, and the two varieties of *A. regularis* described in the present report may turn out to be separate species.

The number of seastars known from the Auckland-Campbell Islands has not been materially angumented; in fact no new form

was discovered there by the author; the different conception alone of the species found there accounts for the difference between the list given by Benham *(Asterina fimbriata* Perr., *Henricia ornata* Perr., and *Stichaster Suteri*, var. *lævigatus* Hutton) and that given here *(Asterina aucklandensis* Koehler, *Henricia lukinsii* (Farquhar), *H. compacta,* var. *auklandiæ* n. var. and *Calvasterias lævigata* Hutton).

From a morphological point of view only one of the new species described here is af special interest, namely *Astropecten primigenius*, which on account of its great number of oral intermediate plates appears to represent the most primitive type of all true Astropectens. The discovery that *Calvasterias lævigata* is one of the brood-protecting forms is likewise of considerable interest.

1. *Astropecten polyacanthus* Müll. & Troschel.

Astropecten polyacanthus. 1842. Müller & Troschel. System der Asteriden; p. 69. Taf. V. Fig. 3

— *armatus.* 1842. Müller & Troschel. Ibidem, p. 71.

— *Edwardsi.* 1867. A. E. Verrill. Descriptions of new Starfishes from New Zealand. Trans. Conn. Acad. I. p. 250.

— *armatus* Gray? 1872. Hutton. Catalogue Echinod. New Zealand, p. 6.

— *polyacanthus.* 1889. Sladen. "Challenger" Asteroidea; p. 201.

— — 1898. Farquhar. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 309.

— — 1906. W. K. Fisher. Starfishes of the Hawaiian Islands. Bull. U. S. Fish Comm. for 1903; p. 1004, Pl. I. 1, Pl. II. 1. a.—b.

— — 1917. F. Jeffr. Bell. British Antarctic ("Terra Nova") Expedition IV. 1. Echinoderma; p. 6.

— — 1917. L. Döderlein. Die Gattung Astropecten u. ihre Stammesgeschichte. Siboga Exped. XLVI. a; p. 134. Taf. 4. 4–5, Taf. 12. 4—5.

— — 1919. W. K. Fisher. Starfishes of the Philippine Seas and adjacent waters. Bull. U. S. Nat. Mus. 100.3. p. 63.

— — 1923. H. L. Clark. The Echinoderm Fauna of South Africa. Annals of the S. African Museum. XIII, p. 249.

Colville Channel, 35 fms. Sandy mud. 21/XII. 1914. Several, mostly young specimens.

Little Barrier Isl., 30 fms. Shells. 29/XII. 1914. 3 large specimens.

Moko Hinau, Hauraki Gulf; 5 fms. Coarse sand, gravel. 30/XII. 1914. 2 specimens.

Off Albatross Point, 25 fms. Sand. 11/I. 1915. 1 large specimen.

Further one specimen received from Professor Benham, from off Cape Campbell, 30 fms.

This characteristic species appears to occur all round the North Island of New Zealand, while there is as yet no records of its occurrence off the South Island, the locality off Cape Campbell being the southernmost one on record till now.

I do not see how to distinguish the New Zealand specimens from those of other Pacific localities (Port Jackson, Misaki etc.). The *Astropecten Edwardsi* of Verrill, accepted by Döderlein as a separate New Zealand variety of *A. polyacanthus*, I must, therefore, regard simply as a synonym of the latter. To make *A. Edwardsi* a separate species, besides *A. polyacanthus*, as is done in the "Index faunæ Novæ-Zelandiæ" is wholly out of question; the description given by Verrill shows beyond doubt that his specimen was of the *polyacanthus*-type, and as the available, fairly rich material of *polyacanthus* from New Zealand seas does not support the view that these specimens make a special, recognizable variety of the species, the conclusion is inevitable that *A. Edvardsi* is simply a synonym of *A. polyacanthus*.

The larger specimens generally have a characteristic coloration; the disk is dark, the arms brownish, this latter lighter colour continuing in a narrow stripe inwards over the disk, sometimes to the centre. There is thus formed a conspicuous, dark starshaped figure on the disk, strongly contrasting against the lighter colour of the arms. There may also be a, more or less distinct, dark band across the arms.

2. *Astropecten dubiosus* n. sp.

Pl. XII. Figs. 3—4.

Off North Cape, 40 fms. 2 specimens. (Capt. Bollons).

R—28 mm; r—6 mm; R=4.7 r; breadth of ray at base 7 mm. Number of superomarginals 22—23.

R—18 mm; r—5 mm; R=3.6 r; — — — 5 mm. — of superomarginals 17.

Arms long and slender, regularly tapering to a point; paxillar area rather narrow. The paxillæ (Fig. 1.d) with ca. 10—12 peripheral and 3—5 central spinelets, all alike, slender and thorny. No enlarged central spinelet. The paxillæ of the disk are slightly larger than those of the arms, diminishing in size only very close to the small central cone. They do not form regular transverse series on the arms. The number of spinelets in the paxillæ gradually diminishes a little on the arms. No pedicellariæ.

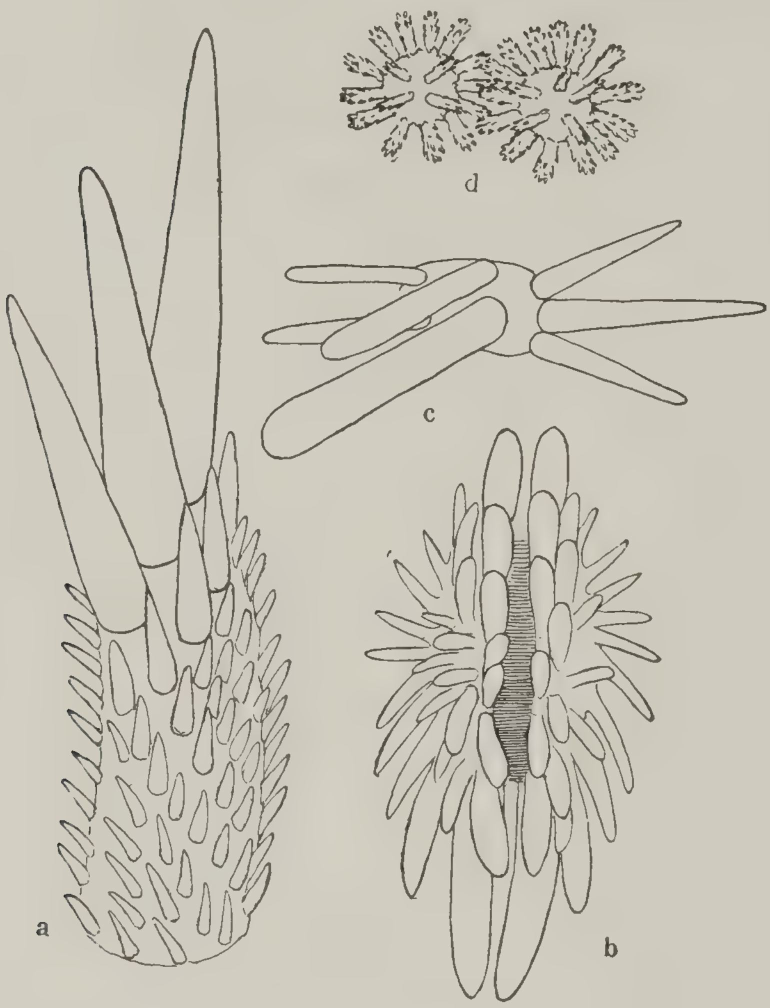

Fig. 1. *Astropecten dubiosus.* a. inferomarginal; b. mouthplates; c. adambulacral plate; d. paxillæ. a—c. $^{14}/_{1}$; d. $^{21}/_{1}$.

Superomarginals covered with a close coat of very fine, short spinelets; the proximal 3—4 ones with an erect, not very prominent or strong spine. In places there is an indication of a spine on a few of the following plates, unto the eighth, from which fact it may be concluded that in adult specimens the superomarginal spine will be developed at least to about the middle of the arms. In the smaller specimen these spines are still very small, even on the innermost plates. The inferomarginals (Fig. 1.a), which project only very little beyond the superomarginals, carry an oblique series of 3—4 pointed, not flattened spines; on the proximal 2—3 plates the uppermost spine is the longest, from about the fourth generally a smaller spine appears above the larger upper one. The lower part of the plate is covered with small spines, somewhat coarser in the middle of the plate.

Terminal plate very finely granular, nearly smooth. In the larger specimen there are no spines on the terminal plate, but in the smaller specimen one of the plates has traces of two fairly robust spines below the point. Probably these spines have then been

lost in the larger specimen, and it may be supposed that the terminal plates are normally provided with such spines.

Adambulacral plates (Fig. 1.c) with 3 furrow spines, the middle one somewhat longer than the lateral ones. Outside these are generally two spines, the distal one conspicuously the larger, and at the abradial edge of the plate 2—3 slender spines. — The mouth plates (Fig. 1.b) are covered with small spines, arranged in three indistinct rows; the distal and proximal spines are enlarged. The inner edge carries two strong, conical spines, which cover the mouth-opening. The marginal series somewhat longer than the superficial spines. — 3 small intermediate plates in each interbrachial space; in the smaller specimen in places only 2. Each carries a grouph of slender spinelets.

Madreporic plate small, very close to the superomarginal edge. It carries at its inner edge a bundle of spinelets, which partly conceals it.

Colour brownish, with an indication of a darker transverse band on the middle af the arms.

The two specimens, which were presented me by Captain Bollons, are dried and not in the very best condition. No doubt they are far from adult. Still it seems necessary to describe them as a new species of the group of the "pluriseriate" Astropectens. Evidently, this species belongs to the "*pectinatus*"-group, and among the species of that group its relations appear to be the nearest with *imbellis* Sladen, from which it differs in the much narrower arms, the shape of the paxillæ, the oral and adambulacral armature. The differences are, however, small and not very important, and were it not that *imbellis* is known only from the Philippine seas, I would be inclined to think the New Zealand specimens to belong to that species.

One of the specimens was sent to Dr. H. L. Clark during his recent visit to the British Museum and he kindly undertook to compare it with the type of *Astropecten imbellis* Sladen. He informs me that he finds it so very much alike *A. imbellis* that he would rather be inclined to regard the differences as merely individual. Still, as both the type, and only specimen known, of *A. imbellis* and the New Zealand specimens are young, immature, it is very

well possible that the adult specimens of the two forms may be recognizably distinct.

In my opinion, it is the safest course for the present, to keep the New Zealand form as a separate species, duly pointing out its close relationship and possible identity with *A. imbellis.* To the Australian species *A. pectinatus* it appears to be not so nearly related.

3. *Astropecten primigenius* n. sp.

Pl. XII. Figs. 1—2.

N. of Cuvier Isl., 30 fms. 2 specimens. (Captain Bollons).

R—28 mm; r. 9 mm; R=3 r; breadth of ray at base 10 mm; number of superomarginals 17.

R—16 mm; r. 6 mm; R=2.7 r; breadth of ray at base 7 mm; number of superomarginals 13.

Paxillar area rather narrow, occupying only half the width of the arm; the paxillæ are arranged in distinct transverse rows on the arms, two rows corresponding to one marginal plate; they are very low, hardly with any pedicel at all, on the disk very crowded and scarcely decreasing in size towards the middle of the disk, where no elevated cone is found. There are about 6—8 central spinelets and an outer circle of about 12, all in the shape of short, smooth grains (Fig. 3).

Superomarginals very broad and low, making a very broad margin to the ray, which is upon the whole low and flattened. No spines on the superomarginals, only a uniform, close covering of low, rounded grains. Inferomarginals (Fig. 2.a) with an oblique series of 6 pointed, closeset, appressed spines. The middle ones are the longest, about so long as the width of the plate only. These spines, accordingly, are very little prominent and hardly to be seen from above. Sometimes there is a small spine adorally to the upper one, the series then consisting of in all seven spines. Further there is another parallel series of 3—4 similar, slightly smaller spines on the upper, aboral edge of the plate, covered by the spines of the primary series and distinctly seen only on the removal of these latter. A series of 4—3 lateral spines is found along the aboral edge of the plate, somewhat smaller than those of the oblique series, likewise closely appressed. Otherwise the inferomarginal

plates are covered with very small, slender spinelets, those close to the primary series of spines being sligthly enlarged, flattened and pointed. — The terminal plate is seen in the small specimen to be covered with the same sort of grains as those of the supero-

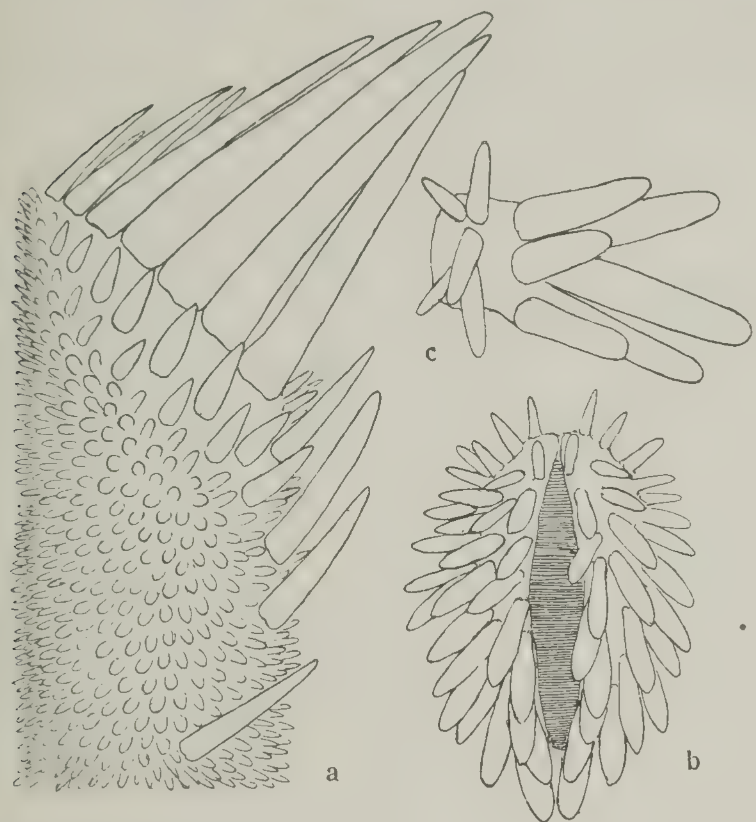

Fig. 2. *Astropecten primigenius.* a. Inferomarginal; b. mouthplates; c. adambulacral plate. All $^{14}/_{1}$.

Fig. 3. *Astropecten primigenius.* Paxillæ. $^{21}/_{1}$.

marginal plates and to carry at the point two short blunt spines on each side.

Adambulacral plates (Fig. 2.c) with three fairly robust furrow spines, the middle one slightly longer than the lateral ones. Outside these is a series of 3—4 subambulacral spines, of about equal size, and at the abradial edge of the plate there are 4—5 spines, not forming a regular series. — The mouth plates (Fig. 2.b) carry on the inner half each two fairly regular series of rather robust spines, while on the outer half the spines are more slender and less distinctly arranged in longitudinal series. On the adoral edge there are two fairly strong, but not much enlarged spines.

The intermediate plates are numerous; the proximal series continues to the outer third of the arms, one corresponding to each adambulacral plate. There are in all 4 series of intermediate plates; the second series ends off the interspace between the second and third inferomarginal, while the third and fourth series are confined to the interradial space. All the intermediate plates

are covered with slender, minute spinules, with a single enlarged spine in the middle.

The madreporite is small, not covered by paxillæ or grains, situated a distance of about its own diameter from the marginal plates. The papulæ are confined to a narrow belt along the interradial edge, continuing only halfway out on the arms. — Colour of the two, dried specimens light brownish.

It is evident that this most interesting species belongs to the "seriventral" group of species, the *Schayeri*-group of Döderlein, but representing a more primitive stage than any other species of the group hitherto known, on account of the much larger number of intermediate plates, the proximal series of which continues nearly to the end of the arm. The difference between the present species and the numerous species with only a single series of intermediate plates along each side continuing only for a short distance along the ambulacral furrow is so considerable that it may seem really questionable whether it can remain within the genus *Astropecten*. But, on the other hand, its general appearance is typical astropectinid [1]). If it ought to form a separate genus (— it cannot be referred to any other genus of Astropectinids hitherto established —) we should, evidently, unite all the other seriventral forms with it. But I do not think it desirable to take this step and prefer, therefore, to leave it in *Astropecten*.

4. *Psilaster acuminatus* Sladen.

Psilaster acuminatus. Sladen. 1888. "Challenger" Asteroidea, p. 225. Pl. XL.1-2. Pl. XLII.7-8.

— — Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales. p. 310.

— — Benham. 1909. Scientific Res. N. Z. G. Trawling Exped. 1907. Echinoderma. Rec. Canterbury Mus. I.2. p. 6.

— — H. L. Clark. 1916. Sealilies, Starfishes, etc. Biol. Res. „Endeavour" IV.1. p. 32.

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[1]) It may not be superfluous to point out that, although the two specimens are dried, I have been able to confirm that the tubefeet are pointed, without a sucking disk. There is then no doubt that it really belongs to the Astropectinids.

Psilaster acuminatus. H. L. Clark. 1923. The Echinoderm Fauna of South Africa. Ann. S. Afr. Mus. XIII. p. 248.

Off White Island, 55 fms.; sandy mud. 1 specimen. 19/XII. 1914
Cloudy Bay, 19 fms. 2 specimens (Capt. Bollons).

Not feeling quite convinced that the present specimens be identical with Sladen's *Ps. acuminatus,* I sent one of them to Dr. H. L. Clark during his stay at the British Museum with the request that he would undertake to compare it with the type of that species. He kindly informed me that there can be no doubt of their identity, and accordingly the identification of these specimens with *Ps. acuminatus* is certain enough.

The reason for my hesitation in this identification was the fact that there is some discrepancy between the description and the figures, given by Sladen. He describes the inferomarginal plates as being partly naked ("covered with membrane"); but in Pl. XLII, fig. 8 they are represented as completely covered with rather coarse squamules, not at all naked — as are my specimens also.

The number of the marginal plates is stated by Sladen to be 40 in specimens of 65 mm R. In the specimens in hand the number of the superomarginals is 27 in two of them, measuring 36 and 46 mm R, and 32 in the third specimen, measuring 36 mm R. It thus appears that there ought not to be laid too much stress on the number of the marginal plates.

Regarding the distribution of this species there is some incertainty as to its occurence in South African seas (cf. H. L. Clark. Op. cit.). Only its occurrence in the New Zealand and the Australian Seas can be regarded as an established fact.

5. *Luidia varia* n. sp.

Pl. XIII. Figs. 13—14.

Little Barrier Isl., 30 fms. Shells. 29. XII. 1914. 2 (? 3) specimens (2 disks and some isolated arms).
Colville Channel, 35 fms. Sandy mud. 21. XII. 1914. Fragment of an arm.

Arms 7. R—ca. 150 mm; r—ca. 15 mm; R = ca. 10 r. Breadth of arm near base 20 mm. Arms robust, high and arched, only at the outer extremity somewhat flattened, tapering very gradually, the

extremity bluntly pointed. Ambulacral furrow very broad; tubefeet very large, bluntly pointed, apparently pluriseriate, but, as seen on a closer inspection, in reality in the normal two regular rows.

Paxillæ on the disk very crowded, not regularly arranged. Along the arms they are arranged in regular longitudinal series, 5 series along each side, on the proximal part of arms 6 series; on the middorsal area of arms the paxillæ are arranged without any order, or, at most, in indistinct longitudinal series; on the distalmost part of arms this area widens so as to occupy nearly the whole dorsal side, only the two lowermost longitudinal series of paxillæ remaining distinct until the end of the arm. The lateral paxillæ are quadrate, those of the middorsal area more or less irregularly rounded. The supramarginal paxillæ correspond in width each to an inferomarginal plate, and are of the same size as the lateral paxillæ; those of the middorsal area are of variable size, some of them being about as large as the lateral ones, while others are distinctly smaller.

Each paxilla generally carries in the middle 6—7 coarse, smooth grainlike spinelets arranged in a circle round a central one which may be slightly larger; the edge is bordered by ca. 20 more slender, slightly elongated spinelets (Fig. 4.d. left figure). One arm alone differs conspicuously from the others in the central spinelet on all the paxillæ, except the superomarginal ones, in the proximal third of the arms being elongated, so as to form a small, blunt spine (Fig. 4.d; right figure). As there is otherwise, at most, the merest indication of a central spine on a few of the middorsal paxillæ in the proximal part of the arms, it seems probable that this arm belongs to a third specimen. — The inferomarginal plates (Fig. 4.a) bear along the median line (3) 4—5, in the proximal part of the arm sometimes even 6 erect, stout, compressed spines, slightly curved, tapering to a blunt point; the three uppermost are the largest, ca. 3—4 mm long, equalling in length 2—3 marginal plates. These spines, as a rule, form fairly regular longitudinal series, not alternating as in the following species. A variable number of smaller, compressed spines irregularly placed among the larger ones, and along the edge of the plate a series of slender spinelets; only along the upper part of the plate a close fringe of fasciolar spinelets is found in the furrow, below the marginal spinelets.

The adambulacral plates (Fig. 4.b) carry three spines, forming a transverse series in continuation of the inferomarginal series of spines. The furrow spine is small, slightly curved, compressed, saber-like. The two outer spines are placed close together; the inner of them is the largest, about as large as the marginal spines,

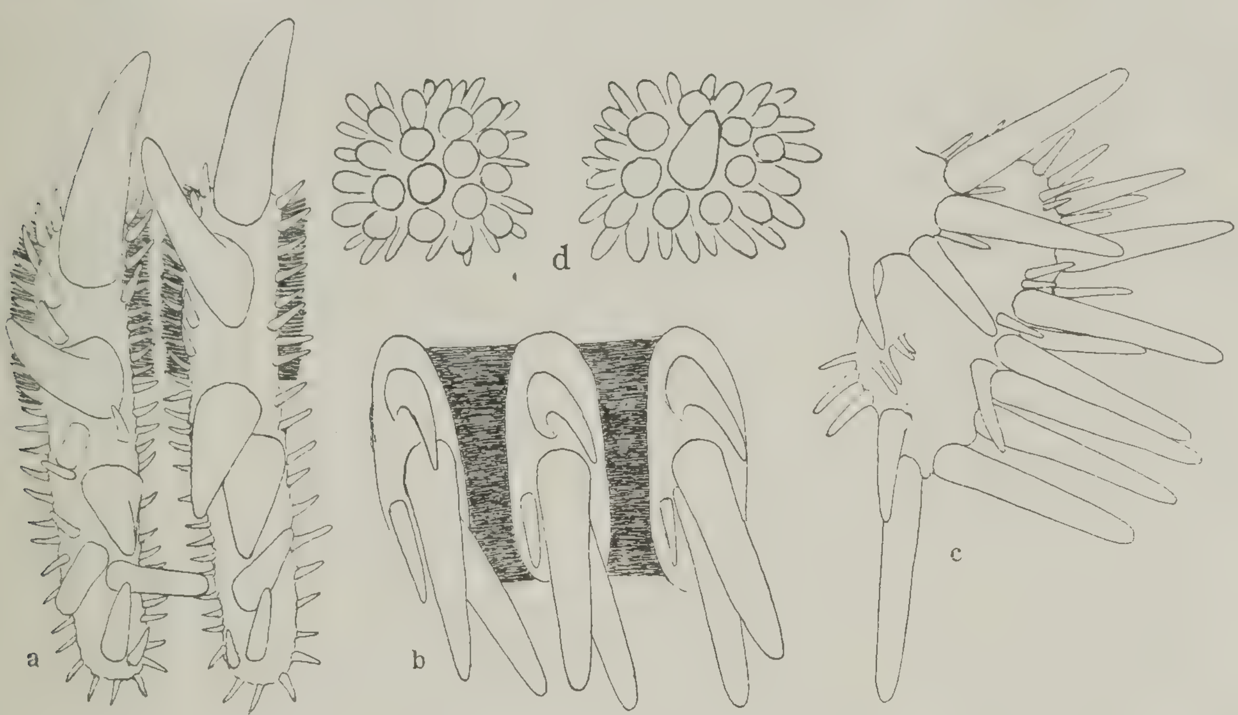

Fig. 4. *Luidia varia.* a. Inferomarginals; b. adambulacral plates (the adradial side is turned up, the distal side to the right); c. mouth plates (jaw) and first adambulacral plate, in side view; d. paxillæ (of two different specimens; cf. text). a—c. $^6/_1$; d. $^9/_1$.

slightly curved, not pointed. Adorally to these two spines is generally found one much shorter and slenderer spine, more rarely two. The adambulacral plates are separated from each other by a rather wide membranous space.

The mouth plates (Fig. 4.c) carry on each half an irregular double-series of spines which are stout and rather long in the proximal part, much shorter and slenderer in the distal part. A series of 4 small, slender spines is found orally along the vertical edge of the mouth plate, diminishing in size downwards, and an irregular group of 4—5 still slenderer spinelets is found on the middle of the vertical sidewall of the mouth plate. — The intermediate plates are small and only in a single series. Each carries a small group of, generally, 6—8 slender spinelets, one of them being sometimes slightly elongated. Farther out on the arm there are mostly only 3—4 spinelets on the intermediate plates; they are, especially in the interradial space, invested by a rather thick

skin, apparently of a glandular character. — The madreporite is almost, or even completely concealed by the paxillæ. — Pedicellariæ are completely wanting.

Colour creamy white, irregularly mottled with black, both on disk and arms, except on the oral side which is of a uniform whitish colour.

This species appears to be the nearest related to the Hawaiian species *Luidia hystrix* Fisher, from which it differs, however, in some important points. In *L. hystrix* the central spine of the paxillæ is much more prominent, and also the inferomarginal and adambulacral armature is somewhat different; then pedicellariæ occur on the intermediate plates in *L. hystrix*, while in *L. varia* they are completely wanting. — Also to *L. maculata* the present species bears some resemblance, but the numerous pedicellariæ of *L. maculata* and the less numerous inferomarginal spines, as also the total absence of a paxillary spine distinguish it markedly from the New Zealand species. Whether the difference in regard to the number of arms — 7 in the New Zealand species, 8 in *L. hystrix* and 7—8 in *maculata* — is a sufficiently constant character, remains to be seen, but the characters pointed out above are proof enough that the New Zealand species is not identical with any of the two said species or, indeed, any other species of *Luidia* hitherto known.

6. *Luidia neozelanica* n. sp.

Pl. XII. Fig. 5.

Luidia sp. Benham. 1909. Sci. Res. N. Z. G. Trawling-Exped. 1907. Echinodermata. Rec. Canterb. Mus. I.2. p. 6. Pl. X.4—5.

Off White Island, 55 fms. Sandy mud. 19. XII. 1914. 9 specimens (mainly broken).

Colville Channel, 35 fms. Sandy mud. 21. XII. 1914. 1 specimen (broken).

Arms 5. R—ca. 100 mm; r.—ca. 10 mm; R=ca. 10 r. (measured on the largest, broken specimen). R.=74 mm; r.=8 mm; R.=9.3r; (measured on the single fairly complete specimen, Pl. XII, Fig. 5). Evidently the length of the arms was, however, still somewhat greater in this specimen, the measured arm having apparently been regenerated. Another, not regenerated arm, with the point broken, is almost as long and must have been not inconsiderably longer. The arms are very narrow and almost imperceptibly tapering towards the point, which is, in the larger specimen, fairly blunt. Breadth of arm

at base, in the larger of the two specimens measured, 13 mm, in the smaller 8 mm. The general appearance of these two specimens thus is very different, the smaller having much slenderer arms. This difference is, probably, due partly to the fact that the larger specimen was in a ripe condition (male), the genital organs causing a swelling of the arms.

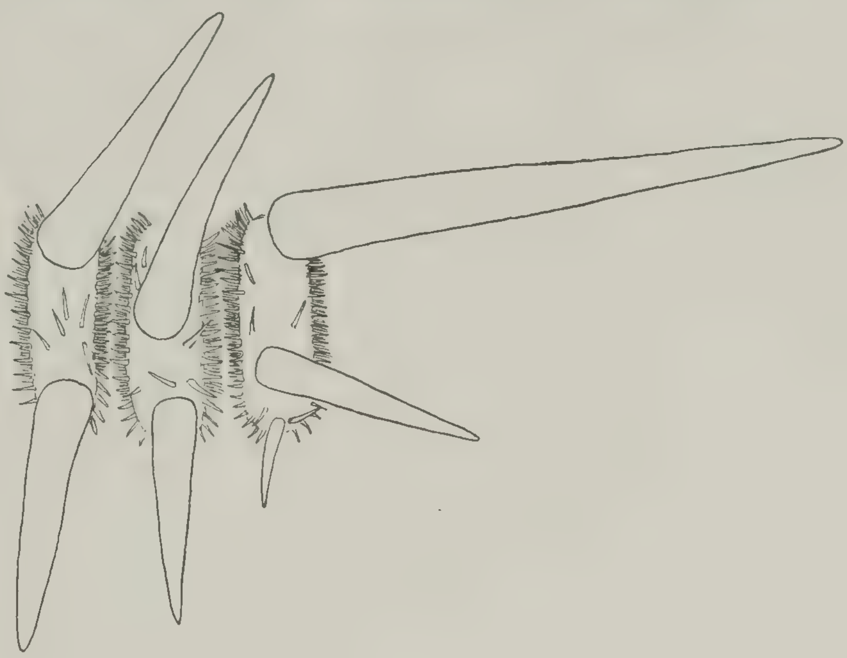

Fig. 5. *Luidia neozelanica.* Inferomarginals. $^6/_1$.

Paxillæ on disk and middorsal area of arms small and crowded, without any regular order. Along sides of arms two longitudinal series of somewhat larger lateral paxillæ. Superomarginal paxillæ larger, crescent-shaped, each corresponding to one inferomarginal plate and to about two lateral paxillæ. About 3—6 central and ca. 10—12 marginal spinelets on the lateral paxillæ, 1—3 central, ca. 8—10 marginal spinelets on the middorsal paxillæ. These spinelets are very slender, finely thorny (Fig. 6.d). One of the central spines may be slightly elongated and more robust than the others. The madreporite small, nearly concealed by the paxillæ.

Inferomarginal plates armed with 2—3 prominent, pointed spines, alternating, the upper spine being on every second plate placed at the upper edge, on the other, intervening plates further downwards, off the interspace between the first and second spine of the former plates (Fig. 5). These plates with the spines placed lower down have generally only two spines. — The uppermost spine is the longest, ca. 7 mm, equalling about 5 marginal plates in length; the middle spine is somewhat shorter than the upper one, the lowermost only about half as long as the upper one. The plate is otherwise sparsely covered with very slender spinelets, surrounded by a rather thick, probably glandular skin. On the adradial end of the plate the spinelets are somewhat longer. A close fringe of capillary spinelets along the edge of the plates, continuing almost to the lower edge.

Adambulacral plates with mostly three spines, a smaller, curved, compressed, saber-shaped furrow spine and two larger outer spines, adorally to which are placed 2—3 smaller spines (Fig. 6.a); in younger specimens the outer (third) spine is very slender and inconspicuous. Mouth plates (Fig. 6.b) on each half with a regular

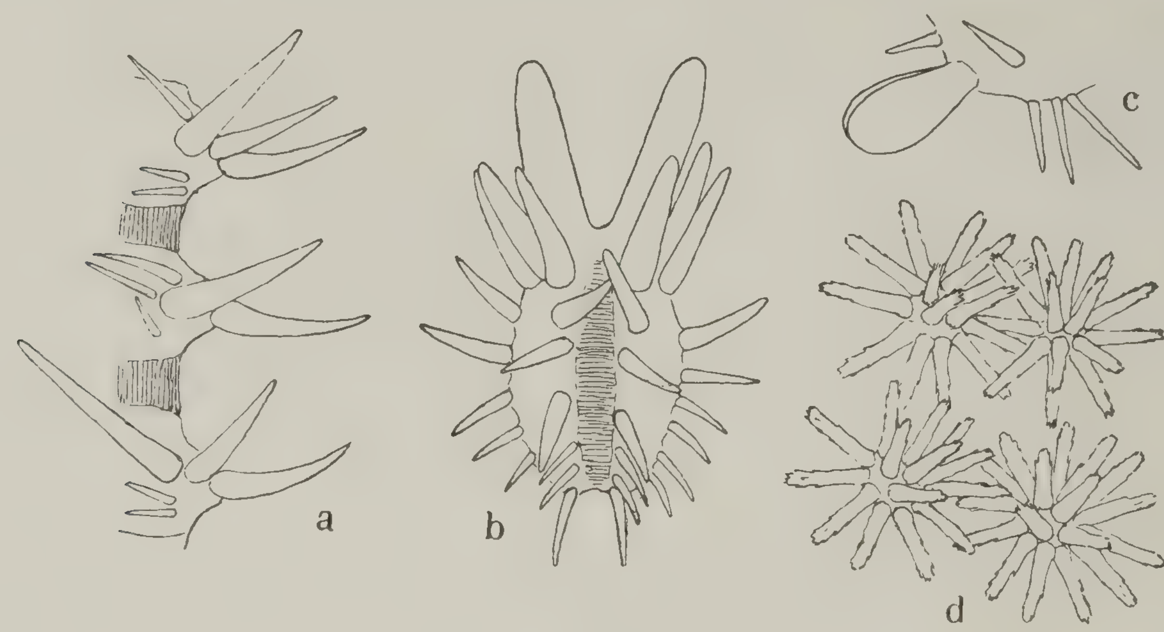

Fig. 6. *Luidia neozelanica.* a. Adambulacral plates; b. mouth-plates (jaw); c. pedicellaria on an oral intermediate plate; d. paxillæ a—b. 9/1; c—d. 21/1.

series of spines along midline and a similar marginal series, diminishing gradually in size outwards. A pair of strong teeth on the oral edge and under these a pair of large, two-valved pedicellariæ or two spines placed close together. — Intermediate plates very small and inconspicuous, in a single series, carrying very few slender spinelets, or a single large bivalved pedicellaria of a more or less clavate shape (Fig. 6.c); in the larger specimen these pedicellariæ occur on most of the plates, in the smaller ones only now and then.

Colour a uniform brownish; the tubefeet not dark. Base of marginal spines brownish.

The *Luidia* mentioned by Benham (Op. cit.) evidently belongs to this species, in spite of the fact that it is stated to have a larger central spine on the paxillæ. As mentioned above there is an indication of the same condition in one of my specimens.

The present species is very closely related to *L. asthenosoma* Fisher from the Californian coasts and to *L. orientalis* Fisher from the Chinese seas — so closely, in fact, that were these found together, one would hardly think of regarding them as distinct

species. Considering the fact, however, that they are known only from very restricted areas very wide apart, we are forced to regard the minor, apparently trivial differences to be observed as good specific characters, the more so as the species of this group (to which belong also *L. sarsi* and *L. africana)* are upon the whole distinguishable only through such apparently unimportant characters. (Cf. W. K. Fisher. Starfishes of the Philippine Seas, p. 168). Not having material of the two named species for a direct comparison with the species from New Zealand I do not think it advisable to state precisely the characters distinguishing the three species, as it could hardly be done satisfactorily from the descriptions alone. If the said three species are ultimately found to have a wider, continuous distribution, I should be inclined to regard them as representing only one species.

7. *Pentagonaster pulchellus* Gray.

Pl. XII. Figs. 6–10.

Pentagonaster pulchellus. J. E. Gray. 1840. A Synopsis of the Genera and species of the Class Hypostoma (Asterias Linnæus). Ann. Mag. Nat. Hist. VI. p. 280.

Stephanaster elegans. Ayres. 1851. Proc. Boston Soc. Nat. History IV. p. 118.

Pentagonaster — J. E. Gray. 1866. Synopsis of the species of Starfish in the British Museum. p. 11. T. 8 fig. 3.

— *abnormalis*. J. E. Gray. Ibidem, p. 11. T. 8. figs. 1—2.

— *pulchellus*. Hutton. 1872. Catalogue Echinod. New Zealand, p. 8.

— — Var. B. Hutton. 1872. Ibidem, p. 8.

— — E. Perrier. 1875. Revision de la collection de Stellérides du Mus. d'hist. nat. Paris. Arch. Zool. expér. V. p. 202.

Astrogonium pulchellum. H. Farquhar. 1895. Notes on New Zealand Echinoderms. Trans. N. Z. Inst. XXVI. p. 200.

— sp. H. Farquhar. 1897. A Contribution to the History of N. Z. Echinoderms. Journ. Linn. Soc. Zool. XXVI. p. 194.

— *pulchellum*. H. Farquhar. 1898. On the Echinoderm Fauna of N. Zealand. Proc. Linn. Soc. N. S. Wales. p. 310.

— *abnormale*. H. Farquhar. 1898. Ibidem, p. 310.

Pentagonaster pulchellus. Benham. 1909. Echinoderma. Sci. Res. N. Z. G. Trawl. Exp. 1907. Rec. Canterb. Mus. I.2. p. 11.
— *abnormalis.* Benham. 1909. Ibidem p. 11. Pl. VIII. fig. 5.

Paterson Inlet, Stewart Isl. 18/XI. 1914. Under stones on the coast. 2 specimens.
Halfmoon Bay, 5—7 fms. Sand. 19/XI. 1914. 1 young specimen.
Queen Charlotte Sound. 3—10 fms. Hard bottom. 20/I. 1915. 1 specimen.
Wellington Harbour. 5—10 fms. 16/II. 1915. 1 specimen.

I have also specimens from Foveaux Strait (Prof. Benham), from off Otago, 20—30 fms. (Prof. Benham), and from Napier (collected by my brother, Mr. H. Mortensen, 1911).

A careful study of the fairly rich material in hand has led me to the conclusion that *Pentagonaster abnormalis* is not to be distinguished from *P. pulchellus,* and I have therefore united it with that species as a simple synonym only. Already Perrier (Op. cit.) states that in his opinion *P. abnormalis* is comprised within the range of variations of *P. pulchellus.* Farquhar (1895) thinks that "when good series of both forms are obtained and compared" the differences will prove sufficiently constant for regarding them as two distinct species, and later on (1897) he states that his examination of further material has convinced him that they are two distinct species. Benham, on the other hand (Op. cit. p. 12) is inclined to think "that the rarer *P. pulchellus* is merely a very abnormal variation of the common *P. abnormalis*", although his material does not appear to him to justify simply uniting them into one species. The material available to me seems to me to leave no doubt but that it is all only one single, very variable species. Although the form with the much swollen outer marginals, Gray's *pulchellus*, appears to be the rarer, the name *pulchellus,* being the first named of the two in Gray's work, is the one to be retained; *abnormalis* accordingly is to be dropped as a synonym only of *pulchellus.* It is a curious fact that the species was never properly described or figured, although mentioned fairly often in literature. Farquhar (1897) states to have drawn up a description of the species, but it was never published. It may therefore not be superfluous to give a somewhat more detailed description of it, accompanied with some figures to show structural details and also to demonstrate the variation in general shape.

The general outline varies rather considerably, some (mainly the larger) specimens being almost regularly pentagonal, others having the interradial margins very concave and the arms fairly prominent. A few measurements will illustrate this:

R—54 mm, r—38 mm. $R = 1{,}4$ r.
R—42 mm, r—22 mm. $R = 1{,}9$ r.
R—26 mm, r—17 mm. $R = 1{,}5$ r.
R—18 mm, r—10 mm. $R = 1{,}8$ r.

The disk is covered with rounded plates, each surrounded by a circle of fine grains. Seen from the inside the plates are star-shaped, the pores of the papulæ lying in groups between the rays of these plates. The plates are more or less elevated, especially a regular median series along each ray and a rosette of 5—6 plates in the middle, round a central plate are generally distinctly elevated, knobshaped. The plates of the side areas of the rays may be more or less distinctly arranged in series parallel to the median series. — The madreporite is large and conspicuous, situated nearer the centre of the disk than the edge, and is often surrounded by three more prominent plates; but this is by no means constant, the surrounding plates being sometimes 4 or 5. The plates of the disk show a peculiar structure, being mottled with numerous small clear spots of a more glassy structure, different from the rest of the plate; probably these clear spots correspond to the "crystal bodies" in the plates of *Goniodiscus* o. a. (Cf. Döderlein. Über Krystallkörper bei Seesternen. Jen. Denkschr. VIII. 1898).

The marginal plates generally number only 4 in each interradial space, besides a pair of much larger plates at the end of the arms. They are more or less swollen, bean-shaped and surrounded by a regular series of small grains like those surrounding the plates of the disk. Sometimes a small plate is developed in the midline between the marginal plates, in the corner between each four adjoining plates; sometimes also a pair of small plates are developed close to the end-plates of the ray. The end-plates (— the term "apical plates" used by Hutton, Farquhar and Benham is not very fortunate —) may be very much enlarged and highly swollen, so as to be several times larger than the other marginal plates; but in other specimens they are much less enlarged,

sometimes only about twice the size of the other marginal plates. On seeing the two extremes together one would scarcely think it possible that they could belong to one and the same species; but all intermediate stages are found, and it is thus beyond doubt that we have here to do only with individual variations. On the point

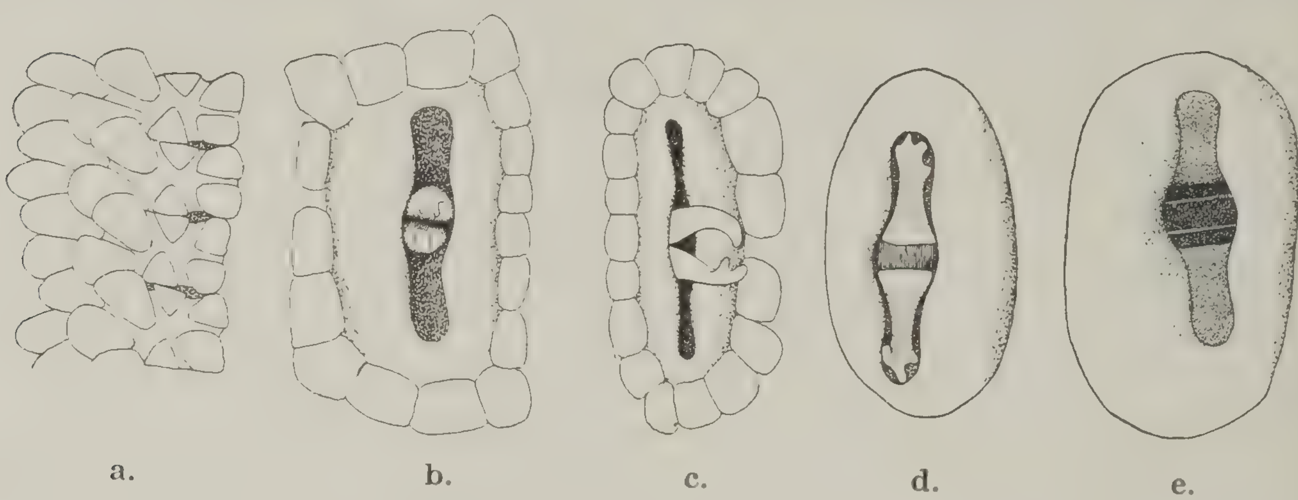

Fig. 7. *Pentagonaster pulchellus.* a. Adambulacral plates; b—e. interradial plates with pedicellariæ; in b. the pedicellaria is closed, seen directly from above; c. half side view, the pedicellaria closed; d. the open pedicellaria in its groove; e. an empty pedicellaria-groove; in d. and e. the grains surrounding the plates are omitted. a. $^6/_1$; b—e. $^{14}/_1$.

of the arms are found a very small terminal plate and one or two pairs of very small plates, evidently representing an outer pair of marginal plates.

The adambulacral plates (Fig. 7.a) carry two thick furrow spines, and outside these two other similar but thicker and shorter spines. Together with those of the opposite side of the furrow these spines form a close covering of the furrow, all the spines standing so close together as to be flattened against one another; they do not show any distinct serial arrangement. The abradial part of the adambulacral plates carry mostly 4 short, grainlike spines, the inner two of them triangular, closely appressed to the corresponding ones of the adjoining plates. — The mouthplates have an armature exactly like that of the adambulacral plates.

The interradial areas of the oral side covered with rather numerous, not regularly arranged plates, each surrounded by a circle of grains as are the plates of the aboral side; but the plates are somewhat smaller than the aboral ones, and generally less elevated; those in the middle of the area are somewhat larger than those along the edges. A various number of the plates along the edge or along the ambulacral furrow, sometimes nearly all the

interradial plates carry a pedicellaria, which is attached in the bottom of a sunk furrow in the plate. When open, the jaws of the pedicellariæ lie concealed in the sunk furrow; when closed, the jaws raise out of the furrow. The jaws have a few coarse teeth in the outer part (Figs. 7.b—e). In the middle of each furrow is seen, on removal of the pedicellariæ, a pair of narrow, raised ridges on which the jaws of the pedicellaria are mowing up and down (Fig. 7.e).

Quite exceptionally a single or a few pedicellariæ may be found also on the aboral side of the disk.

The young specimen from Halfmoon Bay, Stewart Isl., differs from the larger ones mainly in the shorter marginal plates; the two endplates are not yet very prominent, though already nearly the double size of the other marginal plates. On the oral interradial plates only a single pedicellaria has appeared.

The type specimen of this species is stated by Gray to have come from "China". Since the species has not later on been found in Chinese seas, we may well feel justified in assuming that the label of the type specimen was incorrect. Farquhar (1898) further states the species to occur at Australia, from where it is recorded by Tenison-Woods 1879[1]. Since the species has not later on been recorded from Australia, it must be regarded as doubtful whether it really occurs in Australian Seas. The statement (Farquhar, 1898) of its occurrence in the East Indies evidently rests on the fact that "*Astrogonium*" *crassimanum* Möbius is included as a synonym of *P. pulchellus*. But that this is an error appears alone from the fact that *P. crassimanus* carries pedicellariæ on the plates of the aboral side of the disk. It agrees herein with the *Pentagonaster stibarus*, recently described by H. L. Clark from West Australia; (indeed, I do not see how the latter is to be distinguished from *P. crassimanus*).

The result then is that *Pentagonaster pulchellus* is not known with certainty to occur outside the New Zealand Seas. Here it appears to be fairly common off the South Island and Stewart Island, whereas it is not known to occur farther to the North than Napier. According to Farquhar it occurs also at the Chatham Islands.

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[1]) J. E. Tenison Woods. A list of Australian Starfishes. Trans. & Proc. Philos. Soc. Adelaide. 1879. p. 91.

8. *Diplodontias dilatatus* (E. Perrier).

Pl. XII. Fig. 11.

Astrogonium miliare Gray.		Hutton. 1872. Catalogue Echinod. N. Zealand; p. 7.
Pentagonaster dilatatus.		E. Perrier. 1875. Revision de la Collection de Stellérides du Mus. d'hist. nat. Paris. Arch. Zool. expér. & génér. V. p. 217.
Gnathaster	--	Sladen. 1889. "Challenger" Asteroidea; p. 286.
Goniodon	—	E. Perrier. 1894. Exped. Travailleur & Talisman. Échinodermes. p 244.
Gnathaster	—	H. Farquhar. 1898. On the Echinoderm Fauna of New Zealand. Proc. L. Soc. N. S. Wales. p. 311.
Goniodon	—	P. de Loriol. 1901. Notes pour servir à l'Ét. des Échinodermes. IX. p. 43. Pl. III. fig. 6.
—	--	H. Farquhar. 1907. Notes on N. Z. Echinoderms. Trans. N. Z. Inst. XXXIX. p. 126.
Diplodontias	—	W. K. Fisher. 1908. Necessary changes in the nomenclature of Starfishes. Smiths. Miscell. Coll. 52. p. 89.
Goniodon angustus.		R. Koehler. 1911. Description de quelques Astéries nouvelles. Rev. Suisse de Zool. XIX. p. 9. Pl. I.4—7.

Taylor's Mistake, Lyttelton. Rocks, at low water. 2 specimens, collected by Mr. W. R. B. Oliver.

No specimens were collected by the author.

As pointed out by W. K. Fisher, the name *Goniodon* proposed by Perrier for the genus established by him with this species as the genotype, is preoccupied (for a Mollusc), and it thus becomes necessary to adopt the name *Diplodontias* proposed by Fisher.

The species *angustus* established by Koehler is, in my opinion, only a synonym of *dilatatus*. According to Koehler *angustus* differs from *dilatatus* mainly in the shape of the arms, which are gradually diminishing in width towards the point, not widened in the point as is the case in *dilatatus;* further the madreporite is much larger and the adambulacral spines occupy a broader space in *angustus*. Of the two specimens in hand one has the shape of arms typical of *dilatatus*, the other that of *angustus*; in both specimens the madreporite is very large, as in *angustus*. In the specimen with shape of arms as in *dilatatus* the adambulacral spines are much less prominent and occupy a distinctly narrower space than in that

with the shape of arms as in *angustus.* These two specimens, in fact, show the characters of both *dilatatus* and *angustus* thus intermingled that we are forced to recognize both forms as one and the same species. This result is also thus far satisfactory, as it would seem beforehand somewhat remarkable that two species of this comparatively rare form should occur together at the New Zealand coasts. The variation in regard to the shape of its arms offers an interesting parallel to what obtains in *Pentagonaster pulchellus.*

De Loriol points out the existence of glassy warts surrounded by the usual grains on the outer marginal plates. I find these glassy warts likewise in my specimens, not alone on the marginals but also on the outer plates of the middorsal series. — Koehler describes and figures some larger round holes in the madreporite in one of his specimens. I do not see anything of the sort in my specimens and might venture to suggest that these holes are not a normal feature of the madreporite.

This species is not known outside New Zealand, and on the New Zealand coast it is hitherto known with certainty only from the locality given here and the two localities mentioned by Koehler, viz. Te Onepoto (Taylor's mistake, near Lyttelton), and "Wangawai", which would appear, according to the kind information of Professor Benham, to be a misprint for Wanganui, on the West coast of the South Islands.

9. *Asterodon miliaris* (Gray).

Pl. XIII. Figs. 7—8.

Astrogonium miliare. Gray. 1847. Proc. Zool. Soc. London p. 80.
1866. Synopsis of the species of Starfish in the Brit. Mus. p. 10. Tab. I. fig. 3.
— *rugosum.* Hutton. 1872. Catalogue Ech. New Zealand. p. 7.
Pentagonaster miliaris. Perrier. 1875. Revision de la Coll. de Stellérides Mus. Paris. Arch. Zool. expér. V. p. 220.
Gnathaster — Sladen. 1889. Challenger Asteroidea; p. 286.
— *rugosus.* Farquhar. 1897. Contrib. Hist. N. Z. Echinoderms. J. Linn. Soc. Zool. XXVI. p. 194. Pl. 14. fig. 6.
— — Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 311.
— *miliaris.* Farquhar. 1898. Ibidem. p. 310.

Gnathaster miliaris. Farquhar. 1907. Notes on N. Z. Echinoderms. Tr. N. Z. Inst. XXXIX. p. 126.
Asterodon — Benham. 1909. Sci. Res. N. Z. G. Trawling Exp. 1907. Echinoderma. Rec. Canterb. Mus. I.2. p. 8.

No specimens were collected by the author, but two specimens have been presented to the Copenhagen Museum by Professor Benham, one from Foveaux Strait, the other from off Otago, 20—30 fms. These two specimens differ very conspicuously in shape, one having $R = 1.9\ r$ (R—ca. 70 mm)[1]) the other $R = 2.2\ r$ (R—49 mm); in the latter specimen the arms are also narrower and thus much more distinct than in the former, which is more pentagonal. Since, however, no other differences appear to exist between them, we must accept also the long-armed specimen as belonging to this species, though representing, evidently, a rather unusual form which may, perhaps, deserve the recognition as a distinct variety. This can, however, only be decided through the study of an extensive material.

Aside from this variation in regard to the general shape I have nothing to add to the description given by Benham (Op. cit.); but I think it may be useful to give a pair of figures of the long-armed specimen.

10. *Peridontaster Benhami* n. sp.

Pl. XII, Figs. 12—13.

Odontaster Grayi Bell. Benham. 1909. Echinoderma. Sci. Res. N. Z. G. Trawling Exped. Rec. Canterb. Mus. I.2. p. 7.

Foveaux Strait. 20 fms. 1 specimen (Captain Bollons).

This specimen is undoubtedly identical with the form referred by Benham to *Odontaster Grayi* (Bell), but, as suggested by Koehler in his Report on the Echinoderms of the "Deuxième Expédition Antarctique Française 1908—10" (p. 236), the identification with *O. Grayi* is not correct. As is pointed out by Benham (Op. cit.) the New Zealand form agrees in several respects better with *O. penicillatus* (Phil.) than with *O. Grayi;* this, together with the fact that *O. Grayi* is othervise known to occur only in

[1]) This specimen is so much curved that an exact measurement is impossible.

the Magellanic region, makes it the more remarkable that Benham did refer the New Zealand form to *O. Grayi.* The examination of the specimen presented to me by Captain Bollons and the direct comparison of it with a specimen of *O. Grayi* from the Magellanic region leaves no doubt but that the New Zealand form is a distinct species, which I take the pleasure of dedicating to Professor Benham. Unfortunately the specimen is not in the very best condition, but, together with the information given by Benham, it is sufficient for ascertaining the distinctness of the species and for stating the characters in which it differs from the allied species.

Is his splendid work on the Asteroidea of the Australasian Antarctic Expedition [1]) Koehler has given a very careful revision of the family of the Odontasteridæ (or Gnathasteridæ, which he maintains to be the more correct name). According to this the present species must be referred to the genus *Peridontaster* Koehler, which differs from *Odontaster* s. str. in having larger, but less numerous marginal plates and in the spinelets of the paxillæ being much shorter.

The specimen in hand is a young one, only half the size of the two specimens examined by Benham. R=17 mm, r—8.5 mm; R=2 r. The arms are thus distinctly more prominent than in Benham's specimens, which had R=1.87 r (by R=30 mm) and R=1.57 r (by R=33 mm); the facts thus known would seem to indicate that the shape becomes more pentagonal with age.

The plates of the aboral side of the disk rounded, smaller on the arms than on the centre of disk and in the interradial areas; the papulæ are confined to the arms and to the centre of the disk. The midradial series of plates is distinct, the lateral plates less distinctly arranged in longitudinal series, parallel to the midradial series. The latter series continues to the point of the arms, while, according to Benham, in one of his specimens the three-four last superomarginals meet in the dorsal midline; in the other (largest) specimen only the last pair of marginals meet and only in two of the arms. The spinelets of the dorsal plates are short, somewhat coarser on the arms than on the disk; especially on the

[1]) R. Koehler. Echinodermata Asteroidea. Australasian Antarctic Expedition 1911—14. Scientific Reports. Ser. C. Zoology and Botany. Vol. VIII.1. 1920.

interradial plates they are rather distant on account of the fact that rounded, glassy grains are developed on the plates, the spinelets being thus placed in the interspaces between these glassy grains. (Fig. 8). The number of the spinelets is rather different according to the size of the "paxillæ"; there are ca. 5—6 central and 10—15 marginal ones in the midradial plates, and about the same number also in the larger interradial plates. The madreporite is small, situated almost midway between the edge and the centre of the disk. There is a fairly distinct anal pore.

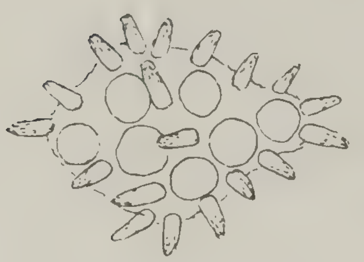


Fig. 8. *Peridontaster Benhami.* Dorsal plate; showing glassy grains among the spinelets. $^{28}/_{1}$.

The marginal plates are 8 to each side of arm, the outer one being still very small. They are rather tumid, separated by broad and deep furrows, and covered on the upper side by very short spinelets, not very closeset, as they are separated through glassy grains. On the low vertical sides the spinelets are somewhat coarser and more closeset, the glassy grains being here less numerous. The covering of the inferomarginal plates is like that of the superomarginals, only the spinelets on the vertical side slightly larger than those of the superomarginals. The unpaired marginal plate is of the same size as the adjoining marginals. — The larger of Benham's specimens also had only 8 marginals on each side of arm, while his smaller specimen had 10 marginals. The terminal plate is fairly large, somewhat triangular.

The armature of the adambulacral plates is somewhat difficult to make out on account of the poor preservation, but it appears that there are two subequal furrow spines, except on the two-three proximal plates, which have three, or even four of them. Apparently there are 3—4 pairs of outer adambulacral spines. The large, unpaired jawspine is somewhat compressed.

The plates of the interradii are arranged in two-three regular series, parallel to the adambulacral plates. The proximal ones are distinctly larger than the distal ones. They are sparsely covered with small spinelets, separated through small glassy tubercles. No pedicellariæ are found.

The present species differs very conspicuously from *Peridontaster Grayi*, especially in the covering of the paxillæ and of the marginal plates, which in the latter species consists of closeset grains; the

glassy tubercles, so prominent a feature in *P. Benhami*, appear not to exist at all in *P. Grayi*. Also the shape of the marginal plates is different, more tumid in the New Zealand species, and especially the furrow separating them is distinctly broader and deeper in the latter. The paxillæ of the aboral side are nearly all of the same size in *P. Grayi*, likewise a conspicuous difference from *P. Benhami*. Finally the presence of pedicellariæ in *P. Grayi* is a very noteworthy difference from the New Zealand species, in which pedicellariæ are not found. The arms are probably upon the whole more prominent in the New Zealand species -- but this may prove to be a less constant character. — The only other antarctic species of this genus, *P. pusillus* (Koehler), is easily distinguished from *P. Benhami* a. o. through its fringe of elongated spines on the marginal plates.

Benham emphasizes the similarity between the New Zealand species and *O. penicillatus* (Phil.). That there is, however, no very close relation between these two species is at once evident from the fact that *penicillatus* belongs to the group of species characterized through having small, paxilliform marginal plates, which constitute the genus *Gnathaster* in the restricted sense (Koehler; op. cit. p. 194).

11. *Nectria pedicelligera* n. sp.

Pl. XIII. Figs. 5—6.

One specimen, collected at Gisbourne, on the East Coast of the North Island of New Zealand, was presented to Prof. Benham by the late Mr. H. Suter. Prof. Benham, who had noticed that it was different from *Nectria ocellifera*, as described by Sladen in the "Challenger" Asteroidea, sent me the specimen for study, for which kindness I beg to offer my sincere thanks. The type, and single known specimen of this interesting species is the property of the Otago Museum.

R—53 mm. r—19 mm; R=2.8 r. The arms are narrow, only very slightly tapering, with an obtuse point. The plates of the aboral side of the disk form elevated, table-shaped paxillæ, as typical of the genus *Nectria*, but they are of very different sizes, contrary to what obtains in the other species, *N. ocellata* and *ocellifera*. Off the base of each arm there is a group of 6—7 large paxillæ;

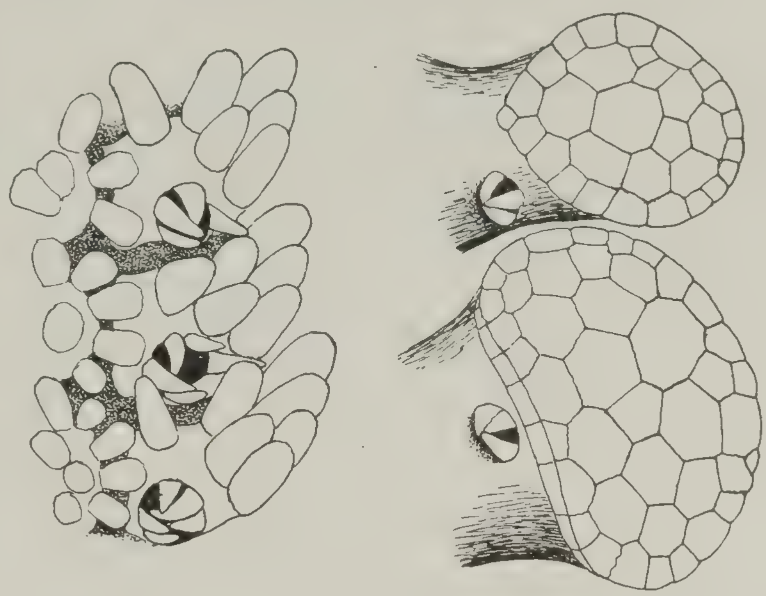
the groups are separated from each other through a double series of very much smaller interradial paxillæ; in the centre of the disk there is a rosette of 6 paxillæ, about half the size of those at the base of the arms and separated form these latter by some smaller paxillæ. The covering of the "tabulum" of the larger paxillæ consists of rather large, flattened grains, very closeset so as to be polygonal (Fig. 9.b). The marginal series consists of much smaller, rounded grains. In the smaller paxillæ also the grains of the tabulum are rounded. The paxillæ remain distinct only at the base of the arms; the outer half of the arms, or a little more, is covered by a close coat of grains, in which may be observed an indistinct arrangement in groups of larger, somewhat flattened grains surrounded by smaller, more rounded grains, corresponding to the paxillar arrangement on the disk, but there is no elevated paxillar shaft and the limitation of the groups is not distinct. The paxillæ of the disk are more closeset than in *N. ocellifera*, especially the large ones off the base of the arms are almost contiguous; the groups of papulæ between the paxillæ are, therefore, much smaller than in the other species. On the arms the papulæ continue about to the middle, the outer half of the arm being entirely without papulæ. The madreporite is small, slightly elevated, situated close to the central rosette of paxillæ.

The marginal plates are rather small and inconspicuous, covered with a uniform coat of grains. There are 26—27 marginal plates along the side of the arms. The terminal plate is rather large, rounded, covered with larger, flattened grains like those on the tabulum of the larger paxillæ. The papulæ along the midline between the marginal plates are developed only in the interradii and along about the inner third of the armsides.

The adambulacral plates carry each three, rather thick, not pointed furrow papillæ; outside these mostly a double series of each two similar, but shorter spines. On the adoral side of each plate is generally found a pedicellaria, consisting of 5—6 slender spines (Fig. 9.a). In a few cases, where the pedicellaria is wanting, there are three spines in the second series. — The jaws carry a marginal series of 6 thick spines, flattened against one another, the two innermost ones of which are distinctly the larger; the two spines at the point may lie so close together as to appear like

one large tooth. Inside the marginal series is another parallel series of 4 somewhat shorter spines, and in the outer part of the jaw is a double series of three still shorter spines, wich may bend against one another so as to have the appearance almost of a pedicellaria. The middle part of the jaw is naked.

The interradial plates are covered with rather coarse grains — or short spines — not regularly arranged. A few of them may carry a pedicellaria. Also on the marginal plates a pedicellaria may be found here and there on some of those in the interradii; it is found only on the proximal side of the plate. Pedicellariæ are also found on the shaft of the paxillæ on the disk (Fig. 9.b), on the larger as well as on the smaller ones. Generally only one pedicellaria is found on each paxilla, but in a few there are two of them. All pedicellariæ are of the same structure: 4—6 slender, slightly curved spines bending against one another, so that their points join.



a. b.

Fig. 9. *Nectria pedicelligera*. a. Adambulacral plates; b. paxillæ, half in side view, showing each a pedicellaria on the shaft. 9/1.

There is a faint trace of reddish colour in the single, dried specimen.

That this is a very well characterized species is easily seen. It differs very markedly from *N. ocellifera* in the shape and arrangement of the paxillæ of disk and arms, in the greater number and smaller size of its marginal plates, and especially in its numerous pedicellariæ, such being found only quite exceptionally in *N. ocellifera*.

Regarding *N. ocellata*, it would appear to agree with *N. ocellifera* in the points which distinguish the latter from *N. pedicelligera*. (I confess that I do not feel quite convinced of the specific validity of *N. ocellata*). The only other species of *Nectria* known, *N. monacantha* (H. L. Clark), differs so very markedly from both *N. ocellifera*, *ocellata* and *pedicelligera*, especially through the quite different character of its disk covering, that I do not feel convinced at all

that Fisher was right in referring this species to the genus *Nectria.* I would rather join H. L. Clark in holding that it might be made the type of a new genus between *Mediaster* and *Nectria* (H. L. Clark. "Endeavour" Echinoderms, p. 43).

12. *Ophidiaster kermadecensis* Benham.

Pl. XIII. Figs. 9—10.

Ophidiaster sp. Farquhar. 1897. Contrib. Hist. N. Z. Echinoderms. J. Linn. Soc. Zool. XXVI. p. 195.

— *kermadecensis.* W. B. Benham. 1911. Stellerids and Echinids from the Kermadec Islands. Trans. N. Z. Inst. XLIII. p. 148.

— -- H. L. Clark. 1921. The Echinoderm Fauna of Torres Strait. Departm. Marine Biology Carnegie Inst. X. p. 78, 83.

One specimen, (R—65—67 mm), dredged off Cuvier Isl. in a depth of 20 fms., was presented to me by Captain Bollons. It agrees completely with the description of specimens from the Kermadec Islands given by Prof. Benham, and with specimens from the Kermadecs which I have received from Mr. W. R. B. Oliver. I have nothing to add to Benham's description, except the observation that the pedicellariæ are sometimes, through rarely, three valved (Fig. 10).

Fig. 10. *Ophidiaster kermadecensis*. Pedicellariæ and empty grooves of pedicellariæ. $^{21}/_{1}$.

Considering how few the Echinoderms common to New Zealand and the Kermadec Islands are, the finding of this sea-star in New Zealand seas is of no small zoogeographical interest.

13. *Asterina (Patiriella) regularis* Verrill.

Asterina (*Asteriscus*) *regularis.* Verrill. 1867. Notes on the Radiata in the Museum of Yale College. Trans. Conn. Acad. I. p. 250.

— *cabalistica.* Lütken. 1871. Forts. kritiske og beskr. Bidrag til Kundskab om Søstjernerne (Asteriderne). Vid. Medd. Naturh. Foren. Kbhvn. p. 242. Tab IV $_1$, 1a—b.

— *regularis.* Hutton. 1872. Cat. Echinodermata New Zealand p. 9.

Asterina regularis. Hutton. 1878. Notes on some New Zealand Echinodermata. Trans. N. Z. Inst. XI. p. 306.

— — Perrier. 1875. Revision coll. Stellérides Mus. Paris. Arch. Zool. expér. V. p. 299.

— — Farquhar. 1895. Notes on N. Zealand Echinoderms. Trans. N. Z. Inst. XXVII. p. 199.

— — Farquhar. 1897. Contrib. Hist. N. Zealand Echinoderms. Journ. Linn. Soc. Zool. XXVI. p. 196.

— — Farquhar. 1898. On the Echinoderm Fauna of N. Zealand. Proc. Linn. Soc. N. S. Wales. p. 312.

— — Benham. 1909. Echinoderma. Sci. Res. N. Z. G. Trawling Exp. 1907. Rec. Canterbury Mus. I. p. 15.

Patiriella — Verrill. 1913. Revision of the genera of Starfishes of the Subfam. Asterininæ. Amer. Journ. Sci. 4. Ser. 35. p. 480.

— — W. K Fisher. 1919. Starfishes of the Philippine Seas. Bull. U. S. Nat Museum. 100. p. 416.

Asterina — R. Koehler. 1920. Echinodermata Asteroidea. Austral. Antarct. Exp. 1911—14. Vol. VIII.1. p. 136.

Non: *Asterina regularis*. F. Jeffr. Bell. 1884. Echinodermata. Report Zool. Collect. H. M. S. "Alert." p. 131.

A considerable number of specimens were collected at the following localities; where no depth is indicated, it means that the specimens were collected under stones, at low water.

Mahia Peninsula, 18/XII. 14. Slipper Island, 20/XII. 14. Takapuna Beach, Auckland, 23/XII. 14. Rangitoto, Auckland, 27/XII. 14. Puhoi Rock, Hauraki Gulf, 29/XII. 14. Bay of Islands, 1/I. 15. North Cape, 3/I. 15. Plimmerton, 15/I. 15. Akaroa Harbour, 14/XII. 14, Paterson Inlet, Stewart Isl. 17/XI. 14. Further in Queen Charlotte Sound, 3—10 fms. 20/I. 15 and Paterson Inlet, 5—15 fms. 18/XI. 14.

The species appears to be distributed all round the New Zealand coasts, from North Cape to Stewart Island. Outside the New Zealand region it is not known.

The development of this species I had the opportunity of studying, while staying in Wellington in February 1915. It was found to have a typical pelagic larva. The genital openings are situated on the dorsal side. (Cf. the Author's "Studies of development and larval forms of Echinoderms" 1921; p. 187).

To the descriptions of this species hitherto given I may add

the following observations. The marginal spines of the jaws are fairly constantly 2 large inner ones on each half and 3—4 distinctly smaller ones outside these. Each half of jaw carries, about on its middle, a large and conspicuous, somewhat outwards curved spine, the two spines of the jaw forming together like a pair of horns. Rarely there are two such spines on each half of jaw, placed side by side. The furrow spines are generally three on a few of the inner adambulacral plates, two on those beyond; as a rule they are unequally developed, the outer one being the larger. The first pair of adambulacral plates (very rarely also the second pair) may carry two outer spines instead of one. The interradial plates of the oral side may be said to carry, as a rule, only one, strong spine; but not rarely those near the margin carry each two spines, and this may continue so far inwards as unto about the middle of the area. Sometimes also a few of the inner plates may carry two spines. Also the spines on the disk plates may vary not inconsiderably; they have, generally, distinctly the shape of short, more or less thorny, closeset spines, but sometimes they are coarse, rounded grains. As a rule the arms are quite distinct, but specimens may be found which are regularly pentagonal. The difference in outline is, however, for the greater part due to the fact that the interradial edge may bend inwards to a various degree on preservation.

Farquhar (Op. cit. 1897) has pointed out that this species is subject to considerable variation, and that several of these varying specimens "are so distinct from normal specimens of *A. regularis*, that if a series were found in a separate locality, a new species might safely be established for them". Among the specimens in hand there are two forms which I should, indeed, be very much inclined to regard as separate species. As I have, however, only little material thereof, I do not feel satisfied that they are really distinct species and therefore shall prefer to designate them only as varieties of *A. regularis*, leaving it to future researches to decide, whether they deserve to rank as separate species. In any case they appear to me so different from the typical form that it is unjustifiable simply to identify them as *A. regularis*.

Variety a. (Pl. XII. Fig. 17). Two specimens from Wellington, sent me by Mr. Farquhar 1911, together with some specimens of the typical form. The diameter is 25—26 mm. They are perfectly

pentagonal; this may, as stated above, be the case also in typical *A. regularis*, but a comparison of such specimens (Pl. XII. Fig. 16) with the variety shows that in these the outer part of the interradial area is flattened and fairly distinctly marked off from the somewhat elevated arms, while in the variety the whole interradial area forms a regular,

a. b.

Fig 11. *Asterina regularis.*
Dorsal skeleton of typical form (a) and of variety a (b). 9/1.

level plane. The plates along the dorsal side of the rays are arranged in very regular longitudinal series, while in the typical form the arrangement of these plates is generally more or less irregular, or the serial arrangement is indistinct on account of the numerous small secondary plates (Figs. 11.a—b). These latter are very sparsely developed in the variety, while, on the other hand, the primary plates are larger in the variety than in the typical form. The spines covering the disk plates are similar in both forms, but in the variety they cover only the proximal top part of the plate, leaving a naked distal part, which appears to be of a somewhat coarser structure. The marginal plates are slightly more elongate in the variety. The characters of the oral side are as in the typical form; one of the specimens has three furrow spines in more than half the length of the arm, the other has two furrow spines in nearly the whole length of the arm. — The colour of the two (dried) specimens is white.

Variety b. (Pl. XII. Fig. 18). Four small specimens from Paterson Inlet, Stewart Isl., found under stones on the coast (18/XI. 14). The largest is only 7 mm in diameter. Two of them are pentagonal, while the other two have the arms fairly distinct. What makes this form look rather different from the typical form is the

spine-covering of the aboral side, the spines being slender and divergent, while in the typical form — also in the young specimens (I have found them so small as 5 mm diameter) — they are thicker and closeset (Figs. 12.a—b). The characters of the oral side are essentially the same as in the typical form, only the spines

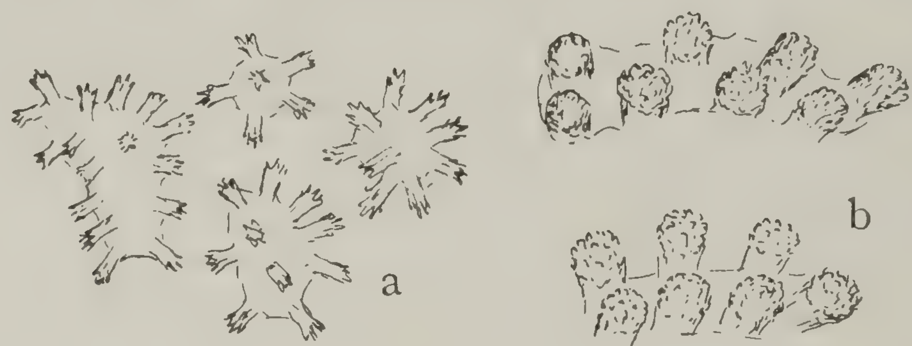


Fig. 12. *Asterina regularis.* Spinelets of dorsal plates in the variety b (a) and in the typical form (b). 28/1.

are somewhat more slender, conical. Also the spines of the marginal fringe appear to be somewhat more elongate than in the typical form. Colour white.

The genital organs are as yet undeveloped, and, accordingly, the specimens are young, immature — be they now true *A. regularis* or a separate species. — It is worth mentioning that on collecting these specimens I was struck with their different aspect from the typical *regularis* and stated in my notebook that probably they were another species.

[*Asterina (Patiriella) Gunnii* Gray.]

Asterina Gunnii. Gray. 1866. Synopsis of the species of Starfish; p. 16.
— — Perrier. 1875. Revision Coll. Stellérides Mus. Paris. p. 298.

Perrier (Op.cit.) records this species from New Zealand, several specimens being found in the Paris Museum, partly from the voyage of Quoy & Gaimard, 1829, partly from the Michelin collection. When the species is omitted in Farquhar's lists of New Zealand Echinoderms it is probably due to fact that he has overlooked Perrier's statement, which was also overlooked by Sladen, who does not give New Zealand as a locality of this species in his "Challenger" Report.

The fact that this species has not been recorded afterwards from

New Zealand seas is rather remarkable, as it would appear from Perrier's statements to be fairly common there; it is hardly conceivable how such a littoral species of not very small size, and which must be expected to occur in fair numbers where it lives, could have been so entirely overlooked. It is therefore very tempting to suggest that the locality "Nouvelle Zélande" may be due to erroneous labelling. At any rate, I do not think it safe to include this species definitely in the New Zealand fauna, until new and incontestable records of its occurence there are at hand.

I would, however, recall a statement by Hutton (Notes on some New Zealand Echinodermata, with descriptions of new species. Trans. N. Z. Inst. 1878. p. 306) about a 6-rayed variety of *A. regularis* from Dunedin, "which can hardly be distinguished from *A. australis*". Possibly this may have been a true *A. Gunnii.* Also there is in the Copenhagen Museum a specimen of *A. Gunnii*, labelled Auckland (received from the Museum of Vienna in 1877). But here, again, there is no certainty that the label is correct. Then, moreover, this specimen differs from the typical *A. Gunnii* in having on the inner 3—4 adambulacral plates 3 outer spines, connected by a web and arranged in an oblique series; farther out there are only two outer spines. This recalls *A. novæ-zelandiæ;* also the furrow-spines are three. But then the interradial plates of the oral side carry only one spine each in the proximal part of the area, farther out two, while in *A. novæ-zelandiæ* especially the proximal plates carry each 3—4 spines. After all I am inclined to think that this specimen may ultimately prove, in spite of its 6 arms and the difference in the spines on the interradial plates, to belong to *A. novæ-zelandiæ*; to *A. Gunnii* it could hardly belong.

[*Asterina (Patiria) novæ-zelandiæ* Perrier].

Asterina novæ-zelandiæ. Perrier. 1875. Revis. Coll. Stellérides Mus. Paris. p. 308.

— *neozelanica.* H. Farquhar. 1909. Further Notes on New Zealand Starfishes. Trans. N. Z Inst. XLI. p. 126.

— *novæ-zelandiæ.* Koehler 1917. Échinodermes (Astéries, Ophiures et Échinides) rec. par M. Rallier du Baty, aux îles de Kerguelen, en 1913—14. Ann. Inst. Océanogr. VII. p. 48. Note.

Asterina novæ-zelandiæ Koehler. 1920. Echinodermata Asteroidea. Australasian Antarctic Exped. Zool. VIII. p. 135. Pl. XXXV. figs. 9—10.

Non: *Asterina novæ-zelandiæ.* Goto. 1914. Monogr. Japan. Asteroidea. Journ. Coll. of Sci. Tokio. XXIX, p. 643. Pl. XIX. 279.

It was suggested by Farquhar (A contribution to the history of New Zealand Echinoderms. Journ. Linn. Soc. London. Zool. XXVI. 1897. p. 196) that Perrier's *Asterina novæ-zelandiæ* might be only an abnormal form of *Asterina regularis*. The original description as well as the additional information and, especially, the figures of the type specimen given by Koehler do not, however, leave any doubt but that this species is entirely distinct from *A. regularis.* But how is it possible that such a large and conspicuous littoral starfish has never been found again? The New Zealand shores certainly have been so much explored that it is hardly conceivable how this species could have been entirely overlooked. I cannot help suggesting that the referring of this species to the New Zealand fauna may be due to an erroneous labelling in the old collection.

14. *Asterina (Asterinopsis) aucklandensis* Koehler.

Pl. XII. Figs. 14—15.

Asterina fimbriata Perr. Benham. 1909. The Echinoderms, other than Holothurians. The Subantarctic Isl. of New Zealand. I. p. 295.

— *aucklandensis.* Koehler. 1920. Echinodermata Asteroidea. Austral. Antarct. Exped. Zoology. VIII. p. 135.

Several specimens found under stones at low water, on the shore of Figure 8 Island and Masked Island, Carnley Harbour, Auckland Islands. 2—3/XII. 1914.

As pointed out by Koehler (Op. cit) the *Asterina* of the Auckland Islands has no nearer relation to the Magellanic *Asterina fimbriata* Perrier, to which it was referred by Benham. In fact it belongs to quite another group of Asterinas than does *A. fimbriata,* viz. the genus *Asterinopsis* of Verrill, *A. fimbriata* belonging to the *Patiriella*-group. As the description given by Benham needs several additions and also a few corrections I think it preferable to give a complete description of the species.

The arms are short, the whole outline being sub-pentagonal, in marked contradistinction to the other species of the *Asterinopsis*-group, especially *A. penicillaris* Lmk. from the Cape region, with its long, narrow arms. The largest specimen in hand measures 28 mm R, 20 mm r; thus R = 1.4 r. The smallest specimen measures 6 mm R, 5 mm r.

In the aboral skeleton the secondary plates are few and small, confined mainly to the proximal part of the rays. The primary plates of the midradial line are distinctly smaller than those in the parallel lateral series; the serial arrangement of the plates in the midline is, in the larger specimens, generally distinct only in the proximal part, the distal part of the ray showing a quite irregular arrangement of the midradial and the adjoining lateral plates. As pointed out by Benham there is a larger, crescentic plate at the base of each ray, which forms together with some similar interradial plates, a more or less prominent circle round the centre of the disk, close to which the small madreporite is situated. Each plate bears a bundle of very slender, closeset spinelets, the number of which amounts to about a hundred on the larger plates; the larger bundles are more or less distinctly crescentic, the concavity being directed inwards (Fig. 13.c). The spinelets on the marginal plates are not longer than those on the aboral plates.

The adambulacral plates are stated by Benham to carry four furrow-spines. I find that generally there are 5—6 furrow-spines, rarely even 7, but sometimes only 4. They are united by a web and form on each plate a comb, situated obliquely, the distal end of the comb turning towards the furrow (Fig. 13.b). The outer adambulacral spines generally form another comb, parallel to that at the furrow, only of somewhat smaller spines, and outside these there are some other, smaller spinelets, irregularly arranged or sometimes also forming a more or less distinct comb. — The jaws carry along their inner edge a close comb of spines, the inner ones the largest; they are generally erect, forming like a fence (Fig. 13.a). Generally there are 7—8 spines to each half of the jaw. Outside these each half of jaw carries a group of spines, arranged in a more or less distinct comb. The interradial plates of the oral side carry a close tuft of ca. 10 slender spinelets on their

proximal angle. They are arranged in very regular series in the usual way.

The colour in life is a beautiful claret colour.

The eggs of this species are large and yolky, which indicates that it has a direct development. On the other hand the fact that the genital openings lie on the aboral side makes it almost certain

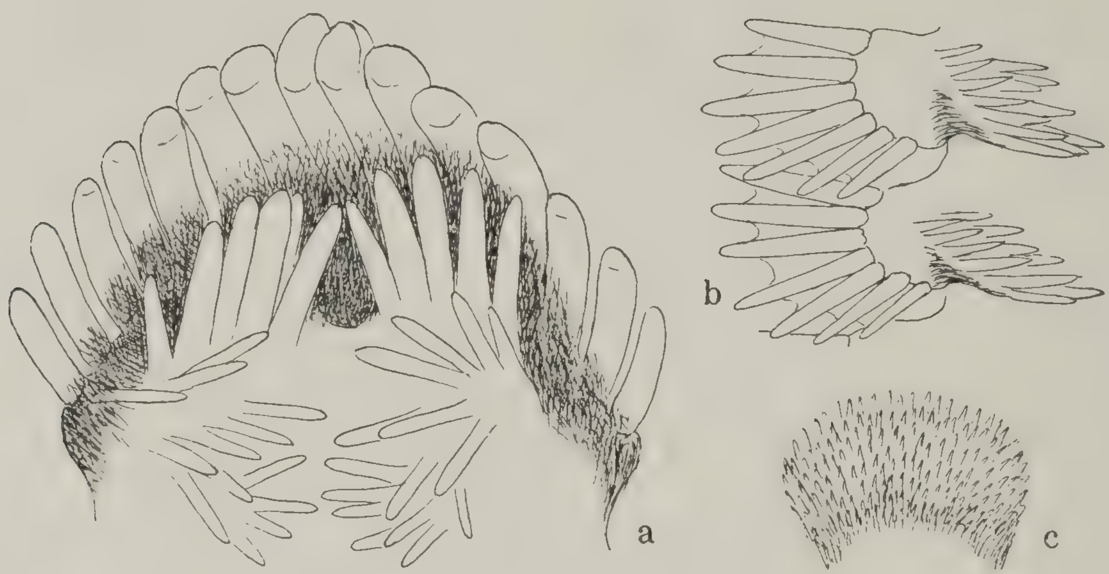


Fig. 13. *Asterina aucklandensis.*
a. Jaw; b. adambulacral plates; c. paxilla. 18/1.

that this species does not protect its brood. It is probable, therefore, that the eggs, in spite of their rather large size, float free in the water.

This species is known only from the Auckland Islands. Whether it is really confined to this small area would seem rather improbable. It may well be expected to occur also at the Campbell Island and perhaps also at Stewart Island and Macquarie Island.

In view of the doubt reigning as to the occurrence of the species *Asterina gunnii* and *novæ-zelandiæ* at the New Zealand coasts the attention of collectors should be called especially to these species. It may therefore be useful to give here a key to the species of *Asterina* known to occur in or recorded from the New Zealand region, in order to facilitate recognizing the species observed. There may perhaps also be a possibility of finding *Asterina exigua* at the New Zealand coasts, and likewise the two varieties of *A. regularis* described above may perhaps prove to be distinct species. Thus the Asterinids of New Zealand may well deserve attention.

1. Adambulacral plates with only one outer spine 2
— — three or more outer spines 3
2. The jaws with a pair of prominent, horn-like outer spines; five more rarely six, rays . . . . *A. regularis.*
No outer spines on the jaws. Six rays . . . . *A. gunnii.*
3. Furrow-spines three; outer adambulacral spines three. *A. novæ-zelandiæ.*
— generally 5—6; outer adambulacral spines numerous . . . . *A. aucklandensis.*

15. *Stegnaster inflatus* (Hutton).

Pl. XIII. Fig. 11.

Pteraster inflatus.		Hutton. 1872. Catologue Echinod. New Zealand. p. 10.
Palmipes	—	Perrier. 1875. Revision Collect. Stellérides Mus. Paris. p. 291.
Stegnaster	—	Sladen. 1889. "Challenger" Asteroidea. p. 778.
—	—	Farquhar. 1895. Notes on New Zealand Echinoderms. Trans. N. Z. Inst. XXVII. p. 199.
—	—	Farquhar. 1898. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales, p. 312.
—	—	Farquhar. 1909. Further Notes on New Zealand Starfishes. Trans. N. Z. Inst. XLI. p. 126. Pl. XII.

1 specimen was collected on the rocks of Island Bay, Wellington, 17/II. 1915. Further I have received from Mr. W. R. B. Oliver some specimens collected at Rangitoto, Takapuna and Browns Bay, Hauraki Gulf.

To the very careful description given by Perrier I would only add that the inwards pointing spines on the oral interradial plates are peculiar in being glassy, not of the structure common in starfish spines. (Fig. 14). This also holds good of *Stegnaster Wesseli* (Perr.), the type species of the genus.

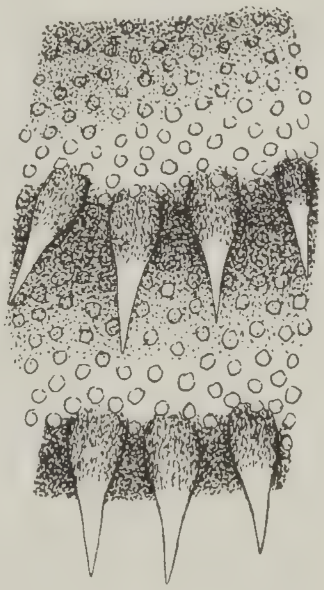


Fig. 14. *Stegnaster inflatus.* Part of oral interradial area, with the peculiar glassy spines. 21/1.

Perrier writes that this species appears to "soulever ordinairement la partie centrale de son corps, de manière que les extrémités des bras et les bords du corps reposent seuls sur le sol; l'animal

prend ainsi une forme renfleé on pyramidale". The specimen which I collected myself was attached to the rock with its whole oral surface, but on being preserved it assumed the peculiar inflated shape. It would thus appear rather to be a post mortem phenomenon, not its normal position. One might perhaps suggest the inflation to have some connection with brooding habits. But about this nothing at all is known — that is for future observations on living specimens.

The species is known to occur only at the New Zealand coasts, and only from Hauraki Gulf in the North to Timaru in the South.

I may recall here the interesting comparison of this species with the remarkable group of fossil starfishes, the *Sphærites*, made by Schöndorf ("Die Organisation und systematische Stellung der Sphæriten". Arch. f. Biontologie. I. 1906. p. 299); it should, however, be pointed out that the resemblance is only apparent, the body of *S. inflatus* being in reality very flat, the high shape of specimens in collections being due to preservation, while in *Sphærites* it is the body itself which is very high, semiglobular.

16. *Henricia lukinsii* (Farquhar).

Pl. XIII. Figs. 1—2.

Cribrella ornata Perr. H. Filhol. 1885. Recueil de Mémoires, Rapports et Documents .... Pass. de Vénus sur le Soleil. III. Mission île Campbell. Chapitre X. Echinodermes. p. 572.

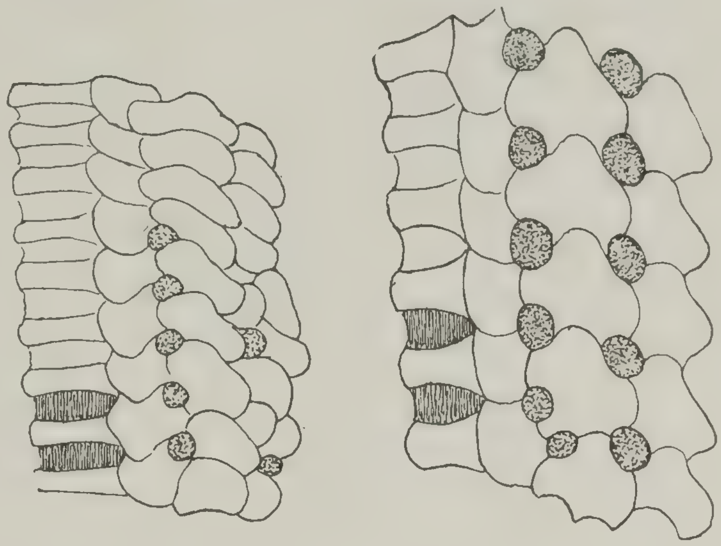
— *lukinsii*. Farquhar. 1898. Notes on New Zealand Starfishes. Trans. N. Z. Inst. XXX. p. 190.

— — Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales. p. 314.

Henricia ornata Perr. (partim, Set A). Benham. 1909. The Echinoderms, other than Holothurians. The Subantarctic Islands of New Zealand. I. p. 298.

Several specimens from Figure 8 Island and Masked Island, Carnley Harbour, Auckland Islands, 30/XI—3/XII. 1914, and from Perseverance Harbour, Campbell Island, 8/XII. 14; found under stones, at low water. One specimen was found, together with *Ophiomyxa brevirima*, in the base of a large *Macrocystis*, cast ashore; the specimen was noticed to be still alive.

This species is very characteristic through its short, blunt arms and through the adambulacral armature, which consists of a single transverse series of fairly robust spines, invested by a rather thick coat of skin. The spines on the adjoining plates are likewise arranged in single transverse series in direct continuation of the adambulacral series, the serial arrangement thus continuing from the ambulacral furrow on to the side of the arms. Though not always quite regular, this series-arrangement is, upon the whole, a very conspicuous feature of the present species. Another noteworthy feature is the existence of a very distinct median depression on the oral side in each interradial area; the two genital openings are situated at the outer end of this depression. One might suggest that these depressions have some connection with the brooding habits of this species (which are, however, totally unknown). In regard to the skeletal structure it should be noticed that the series of oral intermediate plates is fairly regular, reaching somtimes well beyond, sometimes hardly to the middle of the arm. The marginal plates form fairly regular and distinct series, though sometimes there is some disorder to a various extent, especially in the superomarginal series, in the proximal part of the arm, so that they are hardly discernible from the dorsal skeleton (Fig. 15.a).[1]



a. b.

Fig. 15. Skeletal plates from side of arm of *Henricia lukinsii* (a) and *H. compacta*, var. *aucklandiæ* (b). The series of plates are from left to right in each figure: adambulacrals, intermediate, inferomarginals, superomarginals. The muscles between the adambulacrals are drawn only in the two lowermost pairs. $^9/_1$.

It should still be pointed out that the statement in Farquhar's description of the type specimen that there is a very large compact group of spinelets in the centre of the disc, apparently covering the dorsocentral plate, does not hold good of my specimens, which

1) It is by no means always easy to decide what is the intermediate and what the marginal series of plates, especially not without denuding the arm.

show the spinelets of the disk arranged in the same way as upon the arms, in groups of some 5—8 spinelets. Probably the single compact group of spinelets of the type specimen is a result of contraction due to poor preservation.

It appears that *H. lukinsii* does not grow to any large size. The largest of the fairly numerous specimens which I collected measures 22 mm R; Benham's largest specimen was 24 mm R.

This species was referred by Benham to *Henricia ornata* (Perr.) relying on the fact that Filhol (Op. cit.), evidently on the authority of Perrier himself, records his specimens from the Campbell Island under this name. I cannot, however, accept this identification. A direct comparison of these specimens from the Auckland-Campbell Islands with specimens of *H. ornata* from S. Africa, as also with the figures of this latter species given by Koehler in his Report on the Starfishes of the "Scotia" Expedition leaves, in my opinion, no doubt of their specific distinctness.[1]) Benham further is inclined to regard the various antarctic species: *simplex* Sl., *præstans* Sl., *pagenstecheri* Studer and *hyadesi* Perr. as identical with *H. ornata*, relying on the opinions expressed by Bell, Ludwig, Leipoldt, Meissner and Koehler. Without entering on a discussion of the validity of these various forms I may state that I am not at all inclined to regard them all as only one and the same species. Not having access to the species described by Sladen I sent a specimen of the Auckland form to my friend Dr. H. L. Clark, who was just staying at the British Museum with the object of studying the Echinoderm collection there, with the request that he would compare it with those species. He kindly informed me that the Auckland form is quite unlike any of these species, and that he must regard at least *præstans* and *obesa* as distinct species. That *ornata* is, in my opinion, a perfectly distinct species I have already stated. Further I have, through the courtesy of Professor Joubin and Professor H. Lohmann received specimens

[1]) It appears that also Perrier himself has afterwards come to the conviction that the species from Campbell Island is not identical with *H. ornata*. Among the specimens sent me from the Paris Museum there is one named *Cribrella campbellensis* E. Perrier. This is a specimen of *H. Lukinsii*, quite typical, only with one arm bifid. Perrier's name never having been published, not even as a nomen nudum, it cannot replace the name *lukinsii* of Farquhar.

of *H. hyadesi* Perr. from the Paris Museum and of *H. pagenstecheri* from the Hamburg Museum and have thus had the opportunity of forming my own opinion about the relation of these two species to the Auckland Isl. form. *H. hyadesi* with its long, slender arms, and with its not mono-serially arranged adambulacral and marginal spines is so different from the Auckland form that it is seen at a glance that they are entirely different. *H. pagenstecheri* has a considerable superficial resemblance to the Auckland form, so that one might well at first sight think them one and the same species. A closer examination, however, reveals some noteworthy differences. The adambulacral spines are monoserially arranged as in the Auckland form, but the spines of the marginal plates are not thus arranged so that we have not here the arrangement of the spines in transverse series from the ambulacral furrow up to the side of the arms so characteristic of the Auckland form. Further the inner adambulacral spine in *pagenstecheri* is fairly large, horizontally directed across the furrow, almost joining that from the opposite side in the midline, each pair of the tubefeet thus, as it were, being confined within a separate compartment. In the Auckland form the inner ambulacral spine is directed vertically, no such compartment being formed. Also the interradial areas are more naked in *pagenstecheri* and the depression hardly so distinct. Although agreeing that the Auckland form shows a rather considerable resemblance to this Magellanic species, *pagenstecheri*, the characters pointed out seem to me so important that there can be no question of regarding these two forms as one and the same species. I must thus maintain *H. lukinsii* Farquhar as a perfectly distinct species, which is as yet known only from the Subantarctic Islands of New Zealand.

17. *Henricia compacta* (Sladen).

(?) *Henricia occulata* Penn. (?) Hutton. 1872. Catalogue N. Z. Echinodermata, p. 7.

Cribrella compacta. Sladen. 1889. "Challenger" Asteroidea, p. 543. Pl. XCVI. 1—2; XCVIII. 3—4.

— — Farquhar. 1898. Notes on New Zealand Starfishes. Trans. N. Z. Inst. XXX, p. 191.

— — Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 314.

Cribrella compacta. Benham. 1909. Subantarctic Islands of New Zealand. I. p. 300. Note.

Three specimens from the Chatham Island, received from Mr. W. R. B. Oliver, may well be referred to this species, as is done by Farquhar and Benham.

It would appear to be this species which is recorded from the Cook Strait, under the name of *Cribrella ornata,* by Filhol. (Cf. Benham, Op. cit.). As I have no specimens from this locality myself, and as the specimens from the Chatham Islands at my disposal are in a very poor state of preservation, I shall refrain from any discussion of this species.

Farquhar (Op. cit.) thinks that Hutton's *Henricia oculata* belongs to this species, while Hutton himself (Trans. N. Z. Inst. 1878, p. 306) declares it to be *Echinaster fallax* M. Tr. (= *luzonica* M. Tr.). It is no very important matter, which is the correct identification. If Hutton is right, his specimen is certainly not of New Zealand origin.

18. *Henricia compacta,* var. *aucklandiæ* n. var.

Pl. XIII, Figs. 3—4.

(?) *Cribrella ornata.* H. Farquhar. 1898. Notes on New Zealand Starfishes. Trans. N. Z. Inst. XXX. p. 190.
— — H. Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 314.
Henricia — (partim; Set B.) Benham. 1909. The Echinoderms, other than Holothurians. The Subantarctic Islands of New Zealand. I. p. 298.

Masked Island, Carnley Harbour, Auckland Isl.; under stones, at low water. 3/XII. 14. 3 specimens.
Figure 8 Island, Carnley Harbour, Auckland Isl. 2/XII. 14. 6 specimens.
Chatham Islands. Rocks between the tides. (W. R. B. Oliver). 2 specimens.

In his Report on the Echinoderms of the Subantarctic Islands (p. 298—300) Benham states that the specimens of "*Henricia ornata*" from the Auckland-Campbell Islands may be divided into two sets, A and B, the former with a single, the latter with a double row of spines on the adambulacral plates. My material of

Henricias from there likewise forms two such groups. But while Benham regards all as belonging to one and the same species, I think they represent two distinct species, viz. *Henricia lukinsii* — Benham's "Set A" — and the form here designated as *Henricia compacta,* var. *aucklandiæ* — Benham's "Set B". It is true that some of the younger specimens of *H. lukinsii* look rather intermediate, because of their arms being slender as in the present form. But the adult specimens are so different in general aspect and in some structural details that they can, in my opinion, decidedly not be referred to the same species.

The present form differs from *H. lukinsii* in the arms being much longer and slenderer, not swollen at the base. The incisions at the base of the arms and the depression in the oral interradial areas, so characteristic of *lukinsii,* are lacking. The spines on the adambulacral, intermediate and marginal plates stand in groups, not monoserially arranged as in *lukinsii.* However, these groups may form more or less distinct vertical series. The spines of the intermediate plates form a distinct group on each plate, while in *lukinsii* these spines are contiguous with the adambulacral spines, the intermediate series being therefore distinctly discernible only on denuding the arm. In the present form the intermediate series of plates is distinct nearly to the end of the arm or at least in the proximal two thirds. Both series of marginal plates distinct and regular. (Fig. 15.b).

The differences here pointed out seem to me to leave no doubt but that this form is entirely distinct from *H. lukinsii.* Whether it is then to be referred to *H. compacta* or it represents a third species I do not venture to decide, my material of both these forms being altogether too insufficient. There is no doubt that the Auckland form is nearly related to *H. compacta,* but it differs rather markedly from this species in the spinelets being less robust and fewer in each group. Also the madreporite is much more distinct in the Auckland form than in my specimens of *compacta.* — In short, until a rich and well preserved material of both forms becomes available, enabling us to form a definite judgment of the constancy of the differences between these two forms, I think it the safest course to designate the Auckland Isl. form as a variety of *H. compacta.*

19. *Calvasterias Suteri* (de Loriol).

Asterias rupicola. Hutton. 1878. Notes on some New Zealand Echinod. Trans. N. Z Inst. XI. p. 306.
Stichaster Suteri. De Loriol. 1894. Notes pour servir à l'étude des Échinodermes. Rev. Suisse de Zool. II. p. 477. Pl. XXIII 2.
— *littoralis.* Farquhar. 1895. Notes on New Zealand Echinoderms. Trans N. Z. Inst. XXVII. p. 206. Pl. XIII.2.
— *Suteri.* Farquhar. 1897. Contrib. Hist. N. Z. Echinoderms. J. Linn. Soc. Zool. XXVI. p. 197.
- — Farquhar. 1898. Echinoderm Fauna of N. Zealand. Proc. Linn. Soc. N. S. W. p. 313.
— — Benham. 1909. Subantarctic Islands of New Zealand. Echinoderms, p. 302.
Stichorella — Koehler. 1920. Echinodermata Asteroidea. Australasian Antarct. Exped. 1911—14. Vol. VIII. p. 87—89. Pl. XXII.1, 2, 4. LXII.3. LXIII.1.
Calvasterias— W. K. Fisher. 1922. Notes on Asteroidea. III. Ann. Mag. Nat. Hist. 9. Ser. X. p. 597.

While no specimens of this species were collected on the New Zealand coasts, the author found one specimen on a floating *Lessonia* 1 mile E. of Auckland Island, 28/XI. 1914. — Some specimens collected at Godley Head, near Lyttelton, on rocks, at low tide, were received from Mr. W. R. B. Oliver.

The genus *Stichorella,* established by Koehler for this species, is maintained by Fisher to be synonymous with *Calvasterias* Perrier; it appears to me that Fisher is perfectly right herein. To the careful descriptions by de Loriol, Farquhar and Koehler I need only add a few remarks on the pedicellariæ.

Koehler (Op. cit. p. 88) states that the crossed pedicellariæ present no peculiar features except that of their basal part being rather strongly developed relatively to the length of the valves. I do not agree that this is the only peculiarity of these pedicellariæ. The valves are rather peculiar in being of a much less elaborate structure than usually found in the crossed pedicellariæ. Only very few teeth are developed on the blade and arranged without any definite order. The edge is irregularly serrate and no regular series of teeth follow inside, as otherwise usual in this sort of pedicellariæ. The blade also is more distinctly concave than usual, and the shaft is of reticulate structure, not glassy as is otherwise the case in the crossed pedicellariæ. (Fig. 16.a). Upon the whole, it is evident

that these pedicellariæ are of a very primitive structure, and therefore of considerable morphological interest, indicating the way in which the elaborate structure of the crossed pedicellariæ has developed. The straight pedicellariæ (Fig. 16.b) are very small and simple, with finely serrate edge.

a. b.

Fig. 16. *Calvasterias Suteri.* Valves of pedicellariæ; a. of crossed, b. of straight form. 150/1.

Benham records this species from Macquarie Island. As pointed out by Koehler (Op. cit. p. 97) this is probably a mistake; the specimen examined by Benham most probably belongs to the species *Parastichaster Mawsoni* Koehler. Thus, *S. Suteri* is known with certainty only from the South Island of New Zealand, Stewart Island and the Snares Island. But the interesting fact here recorded of a living specimen (young) being found on a floating *Lessonia* in the open sea off the Auckland Island makes it probable that the species will be found also in other places in the subantarctic area of New Zealand.

20. *Calvasterias lævigata* (Hutton).

Pl. XIII. Fig. 12; Pl. XIV. Figs. 3—10.

Asterias rupicola, var. *lævigatus*. Hutton. 1879. Notes on a Collection from the Auckland and Campbell Isl. Trans. N. Z. Inst. XI. p. 343.

Stichaster suteri, var. *lævigatus*. Farquhar. 1898. Notes on New Zealand Starfishes. Trans. N. Z. Inst. XXX. p. 189.

— — —. Farquhar. 1898. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales. p. 313.

— — — Benham. 1909. Subantarctic Islands of New Zealand. Echinoderms. p. 302.

Calvasterias lævigata. W. K. Fisher. 1923. A preliminary Synopsis of the Asteriidæ, a family of Sea Stars. Ann. Mag. Nat. Hist. 9. Ser. XII. p. 606.

Port Ross, Auckland Islands. Under stones, at low tide. 26/XI. 1914. Several specimens.

Masked Island, Carnley Harbour. Under stones, at low tide. 29/XI. 1914. Several specimens.

Figure 8 Island, Carnley Harbour. Under stones, at low tide. 2/XII. 1914. 7 specimens.

Adams Island, Carnley Harbour. Under stones, at low tide. 29/XI. 1914. 3 large specimens.

Perseverance Harbour, Campbell Island. Under stones, at low tide. 8—10/XII. 1914. Several specimens.

While Farquhar and Benham regard this form as a variety only of *C. Suteri,* Fisher gives it the rank of a distinct species. I must decidedly agree with Fisher in this view. The reason for regarding it only as a variety of *C. Suteri* the said authors find in the fact that sometimes a median row of spines is distinctly developed on the arms, as also some spines on the disk. This is perfectly true; it is even not at all rare that all the plates of the aboral side carry spines, the whole of the aboral side, disk and arms, being thus covered by a fairly close coat of spines. (This does not depend upon age, as we find young specimens with numerous spines and large specimens quite destitute of spines). But contrary to the very characteristic, regular arrangement of these spines in *C. Suteri,* the spines in the present species are quite irregularly arranged; at most there is a distinct midradial series, consisting of single spines, while in *C. Suteri* the midradial spines are placed in very regular groups. Also the spines are smaller in the present species than in *C. Suteri*, whereas their microscopical structure is essentially the same in both. (Koehler. Op. cit. Pl. XXII.4). The spines of the inframarginal plates are not rarely 3, sometimes even 4, in an oblique series, against 2 in *C. Suteri*; however, they are more commonly 2, even in large specimens, also in the present species. — In regard to the pedicellariæ I do not find any noteworthy differences between the two species, either in structure or arrangement. The teeth of the crossed pedicellariæ may be somewhat larger than in *C. Suteri*; but this is no constant character.

I made the interesting observation that this species protects its brood in the same way as do so many other sea-stars, the young being attached in great bundles around the mouth of the mother specimen (Pl. XIII. Fig. 12). The fact that in all the

specimens observed the young ones are all in very nearly the same stage of development, evidently just ready to leave the mother, made me think that possibly the eggs might develop within the stomach or in a special brood pouch, as is the case in *Granaster nutrix* Studer and in *Leptasterias groenlandica* (Steenstr.). I did, however, not observe anything to support this suggestion in the several specimens which I opened. — It would be very interesting to know, whether *Calvasterias Suteri* protects its brood in the same way. That it has not typical pelagic larvæ, as suggested by Koehler (Op. cit. p. 88), has been made fairly evident by Fisher (Notes on Asteroidea. Ann. Nat. Hist. 9. Ser. X, p. 597), who found its eggs to be of the large, yolky type. As my own alkoholic specimens happen to be males I can give no new evidences as to this point.

A small specimen of this species is found in the collection of the Copenhagen Museum, which was received, unidentified, from the Paris Museum, 1877. This proves that the species was found there already by Filhol, though not mentioned in his report.

21. *Stichaster australis* (Verrill).

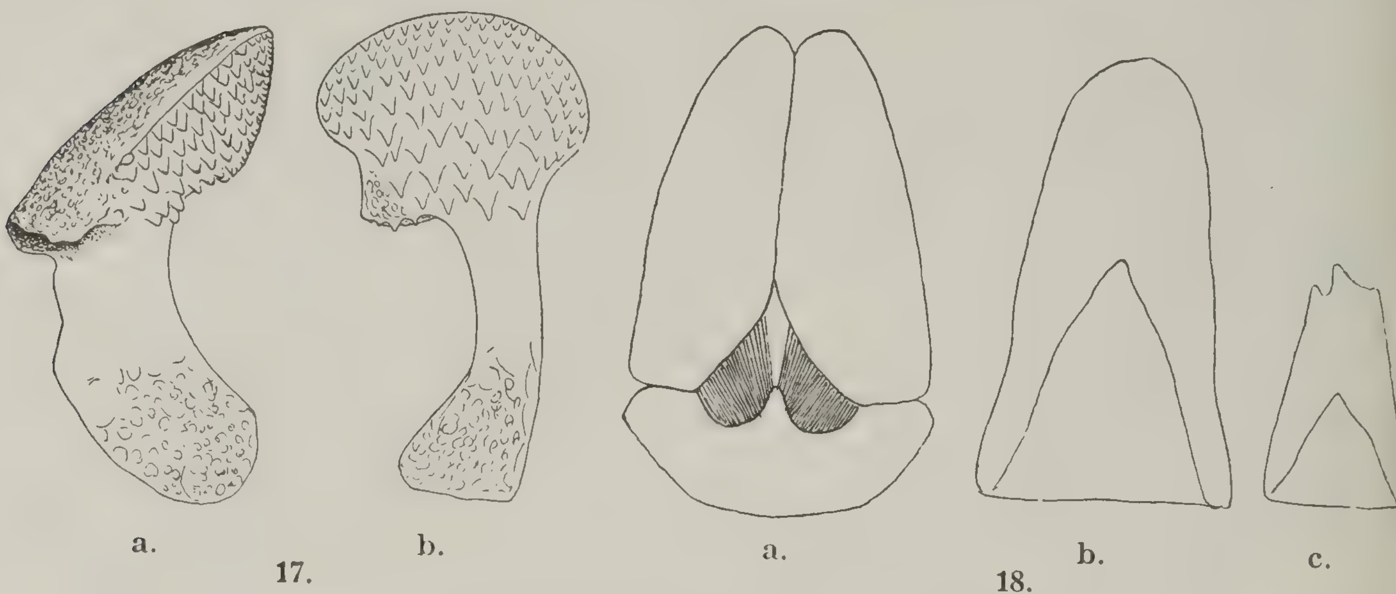
Pl. XIV. Fig. 1—2.

Cœlasterias	*australis*.	Verrill. 1867. Descriptions of new Starfishes from New Zealand. Trans. Conn. Acad. I. p. 247.
—	—	Hutton. 1872. Catalogue Ech. New Zealand; p. 5.
Stichaster	—	Sladen. 1889. "Challenger" Asteroidea, p. 431.
—	—	Farquhar. 1895. Notes on New Zealand Echinoderms Trans. N. Z. Inst. XXVII. p. 202.
—	—	Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 313.
Cœlasterias	—	Koehler. 1920. Echinodermata Asteroidea. Australasian Antarctic Expedition. VIII.1. p. 54, 91.

Several specimens were collected on the rocks, at low tide, at Cape Maria van Diemen; 4/I. 1915. They were found attached in all sorts of crevices in the rocks, attaching themselves so strongly that they were torn to pieces, if one tried to detach them without the aid of a knife — as already stated by Farquhar (1895). Evidently, they are especially adopted to living on rocks exposed to a violent surf. They were found to feed on the mussels (*Mytilus*)

living in the same localities. The fact that their eggs are small, transparent and very numerous indicates that they do not protect their brood, but have a typical pelagic larva.

The species having never been figured, I think it desirable to give some figures of it. Also a few additional remarks may be



Figs. 17—18. *Stichaster australis.* Pedicellariæ.
17. Valves of crossed pedicellariæ, in side (a) and front view (b). 18. Straight pedicellariæ, in outline. a. whole pedicellaria, showing the closing muscles; b. valve, seen from the inside; c. valve of a small form, seen from inside.
Fig. 17 $^{100}/_1$; Fig. 18 $^{33}/_1$.

given to Verrill's description, which, otherwise, is so careful as to leave little to be desired.

The arms vary in number from 10—13, the number 11 or 12 being the more common; only one specimen was found to have 13 arms. In the younger specimens the arms are rather cylindrical, only slightly tapering; only in the larger specimens they can be said to be inflated (probably on account of the genital organs, when these contain ripe sexual products). The largest specimen which I have seen (a dried specimen in poor condition from Kawhia) measures 24 cm in diameter (Verrill's type specimen was 29 cm in diameter). The relation between R and r varies from ca. 2—2.4. The larger spines of the inframarginal plates are stated by Verrill to be arranged in a single row; I find this serial arrangement rather indistinct. His statement that these spines are much larger than the interambulacral (= adambulacral) ones is to be thus understood that they are thicker than these latter, while they are considerably shorter.

The crossed pedicellariæ (Figs. 17.a—b) are interesting in having

the teeth developed to an unusual degree, completely covering the inside of the blade. The straight pedicellariæ (Figs. 18.a—c) are short, simple, rather robust; the smaller ones may have some more or less distinct, coarse teeth at the point.

This species is known to occur only at the coasts of New Zealand, from North Cape to Millford Sound. According to Koehler (Op. cit. p. 91) it is found also at the Auckland Island; but this, evidently, is due to a confusion of the town of Auckland, from where the type specimen came, with the Auckland Island.

22. *Allostichaster polyplax* (Müll. & Troschel).

Asteracanthion polyplax.	Joh. Müller & F. H. Troschel. 1844. Beschreibung neuer Asteriden. Arch. f. Naturgesch. p. 178.
Asterias —	E. Perrier. 1875. Revision de la Collection de Stellérides Mus. Paris. Arch. Zool. expér. & génér. V. p. 63.
Stichaster —	Sladen. 1889. "Challenger" Asteroidea, p. 432.
Tarsaster neozealanica.	Farquhar. 1895. Notes on N. Zeal. Echinoderms. Trans. N. Z. Inst. XXVII. p. 207. Pl. XII. 15—23.
Stichaster polyplax.	Farquhar. 1897. Contr. Hist. New Zeal. Echinoderms. Journ. Linn. Soc. Zool. XXVI. p. 196.
— —	Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 313
— —	Farquhar. 1909. Further Notes on N. Z. Starfishes. Trans. N. Z. Inst. XLI. p. 129.
— —	Benham. 1909. Echinoderma. Sci. Res. N. Z. G. Trawling Exped. Rec. Canterb. Mus. I. p. 15.
Asterias —	H. L. Clark. 1913. The Echinoderms of the Western Australian Museum. Rec. W. Austr. Mus. I. p. 151.
Allostichaster —	H. L. Clark. 1916. Report on the Sea-Lilies etc. obtained by the "Endeavour". Biol. Res. Fishing Experiments "Endeavour". IV.1. p. 70.
— —	R. Koehler. 1920. Echinodermata Asteroidea. Australasian Antarctic Expedition. VIII.1. p. 83. Pl. XVIII.7—11. Pl. LXI.2.

Slipper Island. 20/XII. 14. 1 specimen.
Mahia Peninsula. 18/XII. 14. 1 specimen.
Plimmerton. 15/I. 15. 4 specimens.
Paterson Inlet, Stewart Island. 18. XI. 14. 1 specimen.

All were taken on the rocks at the shore, at low tide.

I have nothing of importance to add to the descriptions of this species hitherto given. Regarding its relation to *Allostichaster insignis*, see under that species.

23. *Allostichaster insignis* (Farquhar).

Stichaster insignis. Farquhar. 1895. Notes on New Zealand Echinoderms. Trans. N. Z. Inst. XXVII. p. 203. Pl. XIII.$_1$.
— — Farquhar. 1898. Notes on New Zealand Starfishes. Trans. N. Z. Inst. XXX. p. 188.
— — Farquhar. 1898. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 314.
— — Benham. 1909. Echinoderma. Sci. Res. N. Z. G. Trawling Exp. Rec. Canterb. Mus. I. p. 15.
Allostichaster — Koehler. 1920. Echinodermata Asteroidea. Australasian Antarct. Exp. VIII.$_1$. p. 85. Pl. XX.$_{2-7}$. Pl. LXV.$_2$.

Masked Island, Carnley Harbour, Auckland Isl. On the rocks, at low tide. 3/XII. 14. 6 specimens.
Figure 8 Island, Carnley Harbour, Auckland Isl. On the rocks, at low tide. 2/XII. 14. 3 specimens.
Port Ross, Auckland Islands; ca. 10 fms. 25/XI. 14. 2 specimens.
Stewart Island, ca. 20 fms. 16/XI. 14. 1 specimen.
Queen Charlotte Sound. 3—10 fms. 20/I. 15. 2 specimens.
Wellington Harbour, 5—10 fms. 16/II. 15. 2 specimens.
Off Albatross Point. 25 fms. 11/I. 15. 5 young specimens.

The species being hitherto recorded only from Wellington to off Otago, it is interesting to have extended its area of distribution down to the Auckland Islands. The specimens from off Albatross Point being very young, its occurrence to the North of the Cook Strait is still uncertain.

Although typical forms of *insignis* and *polylax* are easily distinguished, it is by no means always easy to distinguish the two species from one another. As a rule the spines of *A. insignis* are thicker and coarser than those of *A. polyplax*, but specimens perfectly intermediate in this regard are not rare. The arrangement of the spines on the superomarginal plates varies so considerably in both species, that no reliable difference is to be found herein; neither does the armature of the adambulacral and inframarginal plates and of the whole aboral side, nor the shape of the marginal

plates afford any reliable specific differences. The main difference apparently lies in the number of arms, *A. polyplax* having as a rule 8 arms, *A. insignis* only 6; but specimens with 7 arms occur in both species, and here especially the difficulty of distinguishing one species from the other sets in. Also specimens vith 5 arms,

a. b. c. d.

Fig. 19. Valves of pedicellariæ of *Allostichaster insignis* and *polyplax*. a—b. of crossed pedicellariæ of *A. insignis*, in side view (a) and from the inside (b); c. valve of crossed pedicellaria of *A. polyplax*, from the inside; d. valve of straight pedicellaria of *A. polyplax*, from the inside. 150/1.

evidently such as have never divided, may occur in both species. As a rule it may be said that *A. polyplax* has more slender arms than *insignis*, and also the colour appears to be different, *A. insignis* being generally red or purple, *A. polyplax* dark gray or brownish. The pedicellariæ generally are more numerous in *polyplax*, and also in their structure a slight difference is to be noted, the teeth of the valves of the crossed pedicellariæ being somewhat less numerous, but somewhat longer in *polyplax* (cf. Figs. 19.a—c). The straight pedicellariæ are, in both species, small, generally with the valves ending in three points (Fig. 19.d). In larger specimens the papulæ are more numerous in *insignis* than in *polyplax*.

A. insignis is the more southern of the two species, and not known to occur outside the New Zealand seas, while *A. polyplax* is widely distributed also along the Australian coasts. It is, however, worth noticing that an evidently very close relative of *A. insignis* occurs in the Magellanic region, viz. *Allostichaster inæqualis* Koehler.[1]) — It appears that *A. insignis* grows to a considerably

1) R. Koehler. Astéries et Ophiures. Further Zool. Res. of the Swedish Antarctic Expedition 1901—1903. I. 1923. p. 50—52.

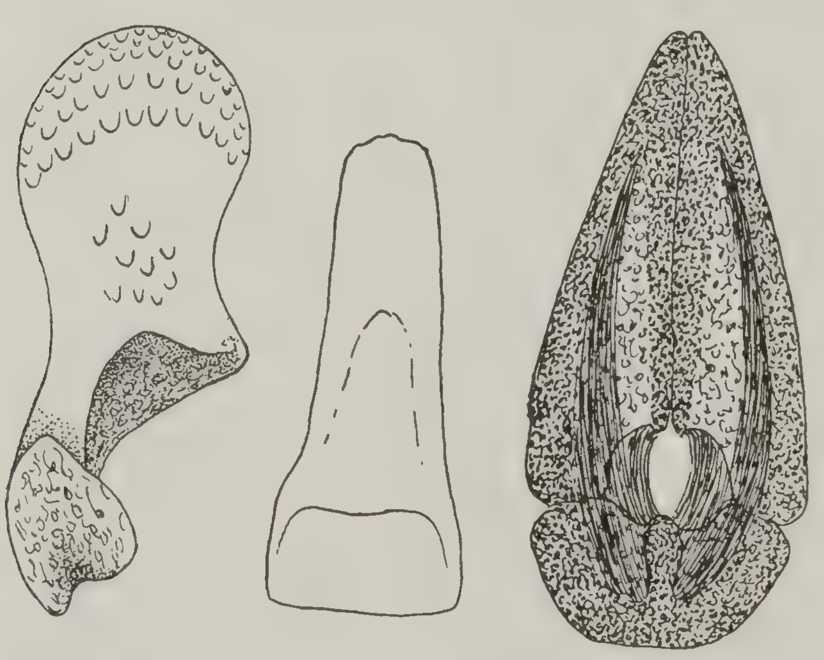
larger size than *A. polyplax.* (Benham records one of R = 88 mm; my largest specimen has R = 50 mm.) — Upon the whole, it is beyond doubt that the two species are perfectly distinct, though — as is evident from the facts here pointed out — rather closely related.

24. *Sclerasterias mollis* (Hutton).

Pl. XIV. Figs. 13–14.

Asterias mollis. Hutton. 1872. Catalogue Echinod. New Zealand; p. 4.
— — Farquhar. 1898. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales. p. 316.
— — Benham. 1909. Sci. Res. N. Z. G. Trawling Exp. Echinoderma. Rec. Canterb. Mus. I.2. p. 19.
Eustolasterias mollis. W. K. Fisher. 1923. A Preliminary Synopsis of the Asteriidæ, a family of Sea-Stars. Ann. Mag. Nat. Hist. 9. Ser. XII. p. 255.
Sclerasterias — W. K. Fisher. 1924. The genus Sclerasterias Perrier. Bull. Inst. Océanogr. Nr. 444.

No specimens of this species were collected by the author; but two specimens, taken off Otago in a depth of 20—30 fms. were presented to the Copenhagen Museum by Professor Benham. One of them is in a fairly good state of preservation, though broken. As the species has never been figured I think it desirable to figure this specimen.



a. b. c.

Fig. 20. *Sclerasterias mollis.*
a. Valve of crossed pedicellaria, from the inside; b. valve of straight pedicellaria (in outline) from the inside; c. large, straight pedicellaria; note the large muscles. a. $^{150}/_{1}$; b—c. $^{45}/_{1}$.

Although a detailed description of the species does not exist, it seems to me not appropriate to try to supply such description on the base of the material available, especially because I have no possibility of comparing it with the other species referred to this genus, which makes it

difficult to point out the characters which distinguish it from the other species of the genus. Only the pedicellariæ may be figured (Figs. 20.a—c). — From the other New Zealand sea-stars of the Asterias-group this species is distinguished at a glance trough having only five arms. It is till now known only from the South Island of New Zealand, from Lyttelton to Dunedin.

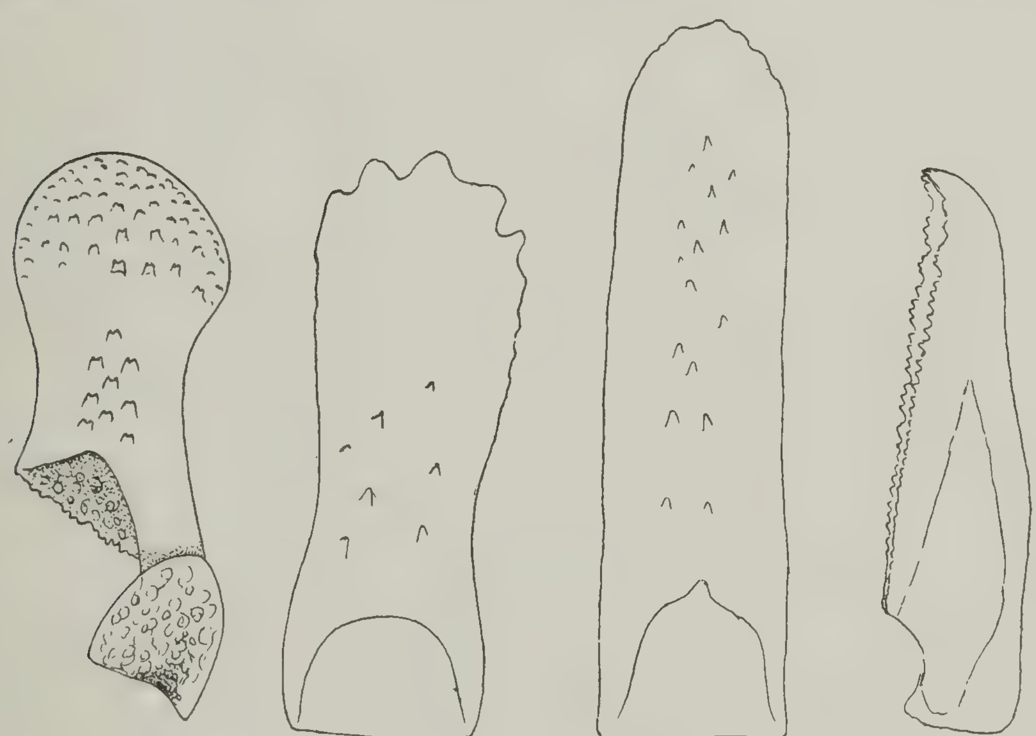
25. *Astrostole scabra* (Hulton).

Pl. XIV. Figs. 11—12.

Margaraster(?) *scaber*. Hutton. 1872. Catalogue Ech. New Zealand, p. 5.
Asterias (Strolasterias) scabra. Farquhar. 1895. Notes on N. Z. Echinoderms. Trans. N. Z. Inst. XXVII, p. 202. Pl. XIII. 3—4.
Asterias scabra. Farquhar. 1898. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. Z. Wales. p. 315.
Astrostole scabra. W. K. Fisher. 1923. Preliminary Synopsis of the Asteriidæ. Ann. Mag. Nat. Hist. 9. Ser. XII. p. 255.

Mahia Peninsula; 18/XII. 14. 2 specimens.
Island Bay, Wellington; 17/II. 15. several specimens. All of them were found on the rocks, at low tide.

As was the case with the preceding species the present species



a. b. c. d.

Fig. 21. Valves of pedicellariæ of *Astrostole scabra* (a—c) and *Coscinasterias calamaria* (d). a. valve of crossed pedicellaria, from the inside; b—c. of straight pedicellariæ, from the inside; d. valve of straight pedicellaria, side view. a. 133/1; b—d. 40/1.

has never been figured either, so it may not be superfluous to give figures of it. For the rest only a few remarks on the pedicellariæ need be made, the figures published by Farquhar (Op. cit.) being not very adequate. The straight pedicellariæ are very prominent in the larger specimens, the larger ones widened and partly more or less serrate along the outer edge. Those on the disk, especially, are serrate and in the same time somewhat shorter and more robust; those along the ambulacral furrows are longer and somewhat more slender, and not serrate in the point. They are generally provided with some scattered teeth, or thorns, on the inside (Figs. 21.b—c). The crossed pedicellariæ are very characteristic in the teeth on the valves being finely serrate (Fig. 21.a).

Like the preceding species *A. scaber* is known only from a very restricted area of the New Zealand coast, viz. from Mahia Peninsula to Akaroa. — Fisher has made this species the type of his genus *Astrostole.*

26. *Coscinasterias calamaria* (Gray).

Asterias calamaria. Gray. 1840. Synopsis of the Genera and species of the Class Hypostoma (Asterias Linn.). Ann. Mag. Nat. Hist. 1. Ser. VI. p. 179.
Coscinasterias muricata. Verrill. 1867. Descr. new Starfishes from New Zealand. Trans. Conn. Ac. I. p. 249.
— — Hutton. 1872. Catalogue Ech. New Zealand. p. 6.
Asterias calamaria. Perrier. 1875. Revision Collect. Stellérides Mus. Paris. Arch. Zool. expér. & genér. V. p. 43.
— — Loriol. 1885. Catalogue raisonné des Echinodermes. Maurice. II. Stellérides. Mém. Soc. Phys. & Hist. nat. Genève. XXIX.$_4$. p. 4. Pl. VII.$_{1-2}$
— — Farquhar. 1895. Notes on New Zealand Echinoderms. Trans. N. Z. Inst. XXVII. p. 200.
— — Farquhar. 1898. Notes on New Zealand Starfishes. Trans. N. Z. Inst. XXX. p. 187.
— — Farquhar. 1898. On the Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales, p. 315.
— — Farquhar. 1909. Further Notes on New Zealand Starfishes. Trans. N. Z. Inst. XLI p. 128.
— — Benham. 1909. Sci. Res. N. Z. G. Trawling Exp. Echinoderma. Rec. Canterbury Mus. I.$_2$. p. 18.
Coscinasterias — H. L. Clark. 1909. Sci. Res. Trawling Exp. “Thetis”. Mem. Austral. Mus. IV. p. 531.

Asterias calamaria.	H. L. Clark. 1914. The Echinoderms of the West Australian Museum. Rec. W. A. Mus. I. p. 151.
Coscinasterias —	H. L. Clark. 1916. Report . . . . . . Sea-Lilies "Endeavour". Biol. Res. "Endeavour". IV. p. 72.
-- —	H. L. Clark. 1923. Some Echinoderms from West Australia. J. Linn. Soc. Zool. XXXV. p. 244.

North Cape; under stones, at low tide. 3/I. 15. 6 young specimens.
Slipper Island; on rocks, at low tide. 20/XII. 14. 2 specimens.
Plimmerton; under stones, at low tide. 15/I. 15. 1 specimen.
Wellington Harbour, 5—10 fms. 16/II. 15. 2 specimens.
Queen Charlotte Sound, 3—10 fms. 20/I. 15. Several specimens.
Stewart Island, 20 fms. 16/XI. 14. 2 young specimens.

The var. *reischeki* of Farquhar (1909) I have no material for forming a definite opinion about; but I am rather inclined to think that it is only a local form of this variable species and hardly entitled to the rank of a distinct variety.

The statement by the same author (loc. cit., 1909) that it "appears probable that the young of this species have only 2 arms at first, and the number increases with age unto 10 or 11" is so contrary to all what we know of Echinoderm development that it would for this reason alone have to be rejected as impossible. It is beyond any doubt that this species divides through autotomy; also the arms are very easily lost and again regenerating. These facts together perfectly account for the instances of specimens with any number of young, regenerating arms.

The crossed pedicellariæ are very similar to those of *Sclerasterias mollis.* The straight pedicellariæ have some more or less distinct, coarse teeth at the point and the side-edges rather distinctly serrate (Fig. 21.d).

Farquhar's suggestion (Op. cit. 1895) that this species may protect its brood is shown to be wrong through the fact that I have proved it to have typical pelagic larvæ. (Studies of the development and larval forms of Echinoderms. 1921. p. 192).

IV. Holothurioidea.

The history of the New Zealand Holothurians is not so intricate as that of the sea-stars and the sea-urchins; the Holothurians being no fancy objects of collectors, as are the latter, unduly labelled specimens from old collections are, as a rule, not met with. On the other hand trouble arises from the fact that careful descriptions and exact, detailed figures of the calcareous deposits in their body wall are absolutely necessary conditions for making the diagnoses sufficient for recognizing the species. The older descriptions do not as a rule fulfil these requirements, and therefore we remain in uncertainty about several of the old species. This applies in a high degree to the descriptions given by Hutton, the first author to describe Holothurians from New Zealand.

In his "Catalogue of the Echinodermata of New Zealand" 1872 Hutton describes the following 8 species, all new to science: *Holothuria mollis, Thyone longidentis, Thyone brevidentis, Th. caudata, Synapta uncinata, S. inæqualis, Chirodota* (?) *alba* and *Molpadia coriacea,* In the paper "Notes on some New Zealand Echinodermata" (Trans. N. Z. Inst. XI. 1878) he adds three more new species: *Cucumaria thomsoni, Labidodesmus turbinatus* and *Holothuria robsoni,* while a new genus, *Pentadactyla*, is established for *Thyone longidentis. Chiridota* (?) *alba* is transferred to *Echinocucumis, Holothuria mollis* is stated to approach *Stichopus*, and *Molpadia coriacea* to be, probably, a *Caudina.* — With the exception of the two Synaptas, not a word is said about the calcareous deposits of the skin of any of these species, and not a figure is given.

In 1881 T. Jeffrey Parker publishes a short description, without figures, of a new *Chiridota, Ch. dunedinensis.* In the "Challenger" Holothurioidea, II., 1886, Théel describes two new species from New Zealand: *Stichopus sordidus* and *Thyonidium rugosum,* while a third species, *Chiridota australiana* Stimpson, is recorded as being doubtfully from New Zealand (Port William. (New Zealand, Falkland Island?)).

The real foundation of our knowledge of New Zealand Holothurian fauna was, however, laid by Dendy in his fundamental paper "Observations on the Holothurians of New Zealand" (Journ. Linn. Soc. London Zool. XXVI. 1897). He had the opportunity of of reexamining the types of all Hutton's species, with the except-

ion of *Holothuria robsoni*, *Cucumaria thomsoni* and *Labidodesmus turbinatus* and thus was able to give the information wanted regarding the calcareous deposits a. o. of those species. He could then also give the proof that Théel's *Stichopus sordidus* was the same as Hutton's *Holothuria mollis*, and that Théel's *Thyonidium rugosum* was the same as Hutton's *Thyone (Pentadactyla) longidentis*, with which species also Hutton's *Thyone caudata* was found to be identical. In the same paper three new species from New Zealand are described, viz. *Cucumaria Huttoni*, *Colochirus ocnoides* and *Colochirus calcarea*.

H. Ludwig (Holothurien d. Sammlung Plate. Zool. Jahrb. Suppl. IV. 1898) declares Dendy's *Colochirus calcareus* a synonym of *Coloch. brevidentis* Hutton, and in another paper in the same year (Holoth. d. Hamburg. Magalhaens. Sammelreise) shows that the *Chiridota australiana* mentioned by Théel is in reality *Trochodota purpurea* (Lesson), the locality being the Falkland Islands, not New Zealand.

In the "Report on the Holothurioidea collected by Prof. Herdman at Ceylon in 1902"[1]) Joseph Pearson identifies a Ceylon Holothurian with Hutton's *Labidodesmus turbinatus*, Herdman having compared for him his description and figures with the type specimen in the British Museum and found no objection to this identification. Since, however, the calcareous deposits of the type specimen had been dissolved, there is, in fact, no guarantee whatever, that the identification is correct, and, moreover, zoogeographical reasons are decidedly against such identification. As there is hardly any possibility for identifying with full certainty any New Zealand species with Hutton's *Labidodesmus turbinatus*, we may perhaps rather leave that name to the ceylonese species described by Pearson under that name, designating it *Cucumaria turbinata* (? Hutton) Pearson, the species then disappearing from the New Zealand fauna.

The next contribution to the New Zealand Holothurian fauna is due to R. Perrier, who describes in 1905 in his paper "Holothuries antarctiques du Mus. d'hist. nat. Paris"[2]) the following new species: *Cucumaria Filholi*, *Phyllophorus anatinus* and *Caudina pulchella*, as also a new variety, *brevicauda*, of *Caudina coriacea*. —

[1]) W. A. Herdman. Report on the Pearl Oyster Fisheries. I. 1903.

[2]) Ann. Sc. nat. Zool. 9. Sér. I. 1905.

In his monograph on "The Apodous Holothurians" 1907 H. L. Clark declares *Caudina coriacea* to be identical with *Caudina chilensis* (Joh. Müller).

In another most important paper by Dendy & Hindle, "Additions to our knowledge of the New Zealand Holothurians" (Journ. Linn. Soc. Zool. XXX. 1907) all the new species described by Perrier are declared to be identical with species described by Hutton. In this paper are further described the following new species: *Stichopus simulans, Phyllophorus dearmatus, Pseudocucumis bicolumnatus, Chirodota gigas* (Chatham Island), *Chirodota geminifera* and *Rhabdomolgus novæ-zealandiæ.* For the latter species a new genus, *Kolostoneura,* was established by S. Becher in 1909.[1])

Finally in 1909 Dendy described in his report on the Holothurians in the "Subantarctic Islands of New Zealand" a new species, *Chirodota benhami* and a new variety, *carnleyensis* of *Cucumaria brevidentis*, while *Cucumaria leonina* Sunper is recorded as new to the New Zealand fauna. In the same year Benham, in his report on the Echinoderma of the N. Z. G. Trawling Expedition describes the new species *Molpadia dendyi* and adds *Molpadia marenzelleri* Théel, hitherto known only from the Deep-sea off New Zealand (700 fms.) to the New Zealand fauna.

In the present paper the following 10 new species are described: *Holothuria neozelanica, Cucumaria amokuræ, C. Farquhari, C. Bollonsi, C. leoninoides* (the species determined by Dendy as *C. leonina*), *Psolidiella nigra, Psolus neozelanicus, Chiridota nigra, Ch. carnleyensis* and *Trochodota Dendyi*, while one, *Pseudopsolus maquariensis* (Dendy) is added, with some doubt, to the New Zealand fauna. Also a new variety, *microurna*, of *Trochodota dunedinensis* is described. Further *Cucumaria calcarea* and *Caudina coriacea* are reestablished as separate species, while *Stichopus simulans* is declared synonymous with *St. mollis*, *Chiridota benhami* and *geminifera* synonymous with *Trochodota dunedinensis*, and *Synapta inæqualis* with *Protankyra uncinata.* A new genus, *Psolidiella*, is established.

The type-specimens of Hutton's *Holothuria Robsoni, Cucumaria thomsoni* and *Labidodesmus turbinatus* being found in the British Museum, I applied to Dr. C. C. A. Monro for a bit of skin of

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[1]) Siegfried Becher. Die systematische Stellung des Rhabdomolgus novæ-zealandiæ. Arch. zool. expér. & génér. 5 Sér. I. 1909.

these species in order that I might be able, perhaps, through a study of their calcareous deposits to settle these questionable species. It proved that in all of them the calcareous bodies have been dissolved. The peculiar wrinkling of the epidermis in *C. thomsoni* enabled me to recognize this species in a pair of well preserved specimens, which I dredged at Stewart Island in 1914. This species proves to be a *Pseudocucumis*, which will thus keep the name *Pseudoc. thomsoni* (Hutton). *Labidodesm. turbinatus* has meantime, as stated above, been — probably wrongly — identified by Pearson with a ceylonese species and thus disappears from the New Zealand fauna, at least for the present. *Holothuria robsoni* can no longer be recognized, and, be it now, as has been maintained, a synonym of *St. mollis* or not, is a *species delenda*, no longer to be taken into account.

The corrected list of New Zealand Holothurians, not including those from the Kermadecs or from the Deep-Sea off New Zealand, then looks as follows, in modern nomenclature:

1. **Stichopus mollis** (Hutton) (= *Stichopus sordidus* Théel, *St. simulans* Dendy & Hindle).
2. **Holothuria neozelanica** n. sp.
   (*Holothuria robsoni* Hutton; species delenda, no longer recognizable).
3. **Cucumaria brevidentis** (Hutton) (**non** = *C. calcarea* Dendy).
4. „ „ var. **carnleyensis** Dendy.
5. „ **calcarea** (Dendy) (**non** = *C. brevidentis* (Hutton)).
6. „ **leoninoides** n. sp. (**non** = *C. leonina* Semper).
7. „ **amokuræ** n. sp.
8. „ **Farquhari** n. sp.
9. „ **Bollonsi** n. sp.
10. „ **alba** (Hutton) (= *C. Filholi* R. Perrier).
11. „ **ocnoides** (Dendy).
12. „ **Huttoni** Dendy.
13. **Phyllophorus longidentis** (Hutton) (= *Thyone caudata* Hutton, *Thyonidium rugosum* Théel, *Phyllophorus anatinus* R. Perrier).
14. **Phyllophorus dearmatus** Dendy & Hindle.
    (*Labidodesmus turbinatus* (? Hutton) Pearson; Ceylon, not New Zealand).

15. **Pseudocucumis Thomsoni** (Hutton).
16. „ **bicolumnatus** Dendy & Hindle.
(?)17. **Pseudopsolus macquariensis** (Dendy).
18. **Psolidiella nigra** n. g., n. sp.
19. **Psolus neozelanicus** n. sp.
20. **Caudina coriacea** (Hutton) (= *C. pulchella* R. Perrier, *C. coriacea*, var. *brevicauda* Perrier; **non** = *C. chilensis* (Joh. Müll.).)
21. **Molpadia marenzelleri** Théel.
22. „ **Dendyi** Benham.
23. **Protankyra uncinata** (Hutton) (= *Synapta inæqualis* Hutton).
24. **Chiridota gigas** Dendy
25. „ **nigra** n. sp.
26. „ **carnleyensis** n. sp.
(*Chiridota australiana* Stimps. — not New Zealand).
27. **Throchodota dunedinensis** (Parker) (= *Chiridota geminifera* Dendy & Hindle, *Ch. benhami* Dendy).
28. **Trochodota dunedinensis**, var. **microurna** n. var.
29. „ **Dendyi** n. sp.
30. **Kolostoneura novæ-zealandiæ** Dendy & Hindle).

The "Index Faunæ Novæ Zealandiæ" gives 21 species of Holothurians as belonging to the New Zealand fauna. If we eliminate the deep-sea forms, the problematic or synonymous species *Holoth. robsoni*, *Cucum. turbinata* and *Synapta inæqualis* and also *Pseudopsolus macquariensis*, by that time known only from Macquarie Island, the list is reduced to 11 species. As the list of Holothurians now known to occur in New Zealand seas comprises 30 species and varieties, the increase in our knowledge of New Zealand Holothurian fauna since the publication of the "Index" is rather noticeable. Still, we may well feel confident that the list is as yet far from complete, and that a thorough investigation of the New Zealand seas, especially the deeper parts of the Cook Strait, the North Cape Region and the West Coast of the South Island, will yield many an interesting discovery.

From a purely morphological point of view none of the new forms here described are of special interest; in this regard *Cucumaria Farquhari* may well be said to stand foremost among them, the reduction of its tubefeet to the middle part of the trivium re-

presenting an interesting specialization analogous to that found in *Psolus*. From a biological point of view the most interesting form is *Psolidiella nigra*, which, evidently, is specially adopted to life on coastal rocks, though hardly in places exposed to heavy surf.

Of the species enumerated above I had no opportunity of studying the following three: *Pseudocucumis bicolumnatus*, *Molpadia Marenzelleri* and *M. Dendyi*.

1. *Stichopus mollis* (Hutton).

Holothuria mollis. Hutton. 1872. Catalogue Echinod. New Zealand; p. 15.
— — Hutton. 1878. Notes on some New Zealand Echinod. Trans. N. Z. Inst. XI. p. 308.
Stichopus sordidus. Théel. 1886. "Challenger" Holothurioidea. II. p. 167. Pl. VIII.$_3$.
Holothuria victoriæ. Bell. 1887. Studies in Holothurioidea. VI. Proc. Zool. Soc. p. 534. Pl. XLV.$_7$.
Stichopus mollis. Dendy. 1896. Observ. Holoth. New Zealand. J. Linn. Soc. Zool. XXVI. p. 46. Pl. 7.$_{73-82}$.
— — Whitelegge. 1897. On Stichopus mollis. Rec. Austral. Mus. III.$_2$. p. 50.
— — Farquhar. 1898. Echinod. Fauna New Zealand. Proc. Linn. Soc. N. S. W. p. 326.
— — Ludwig. 1898. Holoth. Hamburg. Magalhaens. Sammelreise; p. 7.
— — R. Perrier. 1905. Holoth. Antarct. Mus. Paris. Ann. Sc. Nat. Zool. 9. Sér. I. p. 83.
— — Dendy & Hindle. 1907. Add. Knowl. N. Z. Holoth. J. Linn. Soc. Zool. XXX. p. 96. Pl. 12.$_{12}$.
— *simulans*. Dendy & Hindle. Ibidem, p. 97. P. 11.$_5$.
— *mollis*. W. Erwe. 1913. Holoth. Südwest-Küste Austral. in: Hartmeyer & Michaelsen: Fauna S. W. Australiens. IV. p. 387. Taf. VII $_{22}$.
— *simultans* (sic!) W. Erwe. Ibidem. p. 388. Taf. VIII $_{23\cdot a-d}$.
— *mollis*. Joshua. 1914. Victorian Holothurioidea. Proc. R. Soc. Victoria. 27. p. 2.
— *simulans*. Joshua. Ibidem. p. 3.
— *mollis*. H. L. Clark. 1922. The Holothurians of the genus Stichopus. Bull. Mus. C. Zool. LXV. p. 60.
— *simulans*. H. L. Clark. Ibidem, p. 69.

Paterson Inlet, Stewart Island; 5—15 fms. 17/XI. 1914. Several specimens.
Queen Charlotte Sound; 3 – 10 fms. 20/I. 1915. 8 specimens.
Wellington Harbour; 5—10 fms. 16/II. 1915. 2 specimens.
Plimmerton; the coast, at low water. 15/I. 1915. 1 specimen.

The specimens from Stewart Island are somewhat lighter coloured than those from the other localities, and their dorsal papillæ upon the whole less prominent, the dorsal side being sometimes quite smooth. As, however, no other differences have been observed, I have no doubt in referring also these Stewart Island specimens to this well known species. To the various descriptions quoted above I would add only the fact that the short branches of the tentacles are supported by numerous very strong, spinous, curved rods (Fig. 22.f). Similar rods may be found, more or less numerous, along the radial water-vessels.

Ludwig (Op. cit. 1898) has suggested that Hutton's *Holothuria robsoni* may be the same as the present species, and ever since it has been taken for granted that it is so. There is, however, no proof whatever of this suggestion, and since the calcareous bodies of the type specimen have been dissolved, there is no longer any possibility for settling the question. *Holoth. robsoni,* therefore, being no longer recognizable, is a species delenda, no more to be taken into account.

As regards *Stichopus simulans* Dendy & Hindle I have come to the result that it is certainly identical with *St. mollis.* Among the specimens from Stewart Isl. I found two to contain the peculiar foliaceous spicules ("rosettes" in usual nomenclature) described by Dendy; in one of them I observed only very few of them, in the other I found them numerous in one small spot of the skin, but could not detect them in any other place. These two specimens are, otherwise, so perfectly alike the rest of the specimens from this locality that it would seem quite absurd to regard them as a separate species. I may opinion there can be no doubt but that the said foliaceous spicules ("rosettes") belong typically to *Stichopus mollis,* only they are exceedingly variable as to the number in which they occur, being sometimes very numerous in places or, perhaps, in the whole of the skin, sometimes very scarce, sometimes apparently totally absent. The latter case would seem to be the most common.

In the same place where the numerous foliaceous spicules were found, as stated above, also a number of thin, spinous rods occur, lying quite without order among the other spicules (Fig. 22.e). They are partly lying so close that one is reminded of a piece of a monaxonid sponge. But there is no possibility for doubting that they

do really belong to the Holothurian and they may thus be regarded as typically belonging to this species, like the foliaceous spicules, but like these latter of very variable (rare) occurrence.

Stichopus juv.

From Paterson Inlet, Stewart Isl., 5—15 fms., mud, there is a very small specimen of a *Stichopus*, only 9 mm long (somewhat contracted) which I must hesitate in simply referring to *Stichopus*

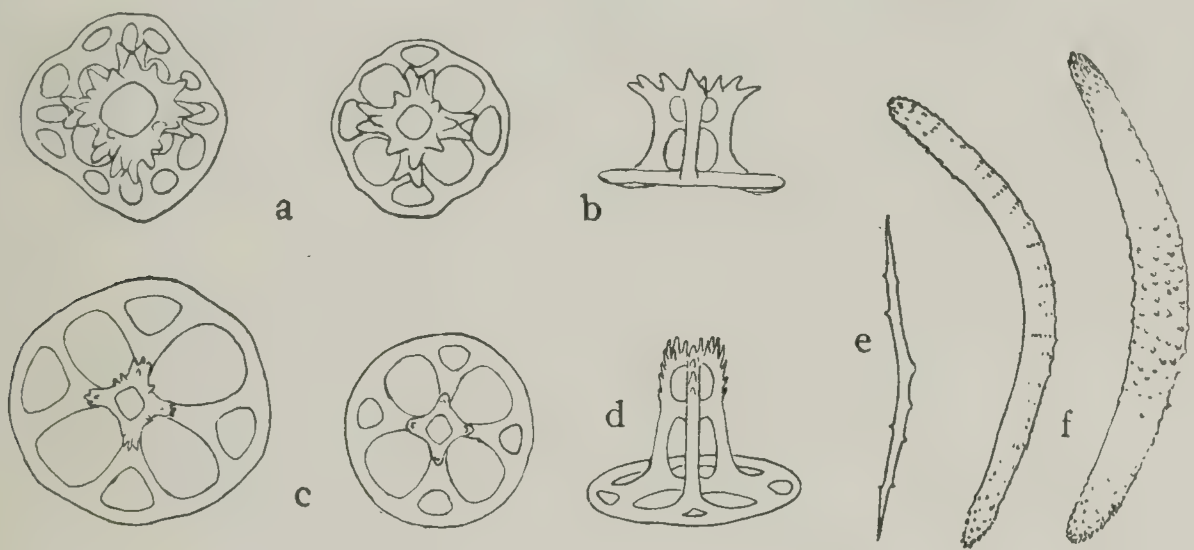


Fig. 22. Spicules of *Stichopus mollis*.
a—b. Tables of adult specimen, from above (a) and in side view (b); c—d the same from a young specimen; e. spinous rod from the skin; f. thorny rods from the tentacles. a—e. 230/1; f. 60/1.

mollis. It is white, differing thus very markedly in colour from the dark brown or black *St. mollis*; this, however, may easily be imagined to be only a character of youth. More important is the difference in the spicules. These are tables, as in *St. mollis*, but the spire is more elongate and the spines of the crown distinctly more numerous and smaller than in the adult *St. mollis;* also the disk is more regular round in the young specimen (Figs. 22.c—d. to compare with Figs. 22.a—b). In view of the small size of this specimen it is clear that any other differences which might be pointed out between this specimen and the adult *St. mollis* may be due to age. But it does seem rather enigmatical why the tables of the young should be so characteristically different from those of the adult.

So long as we know only the one species of *Stichopus*, *S. mollis* from New Zealand, it lies at hand to suppose that this is really the young of this species; but the marked differences pointed out must make us put off simply declaring it to be so, until inter-

mediate stages — or direct observations of the postembryonic development of the species — have given the definite proof.

2. *Holothuria neozelanica* n. sp.

2 Miles E. of North Cape; 55 fms. 2/I. 1915. 1 specimen.

The specimen, which is very strongly contracted, measures 10.5 cm in length and ca. 5 cm in breadth. It is of a dirty grayish

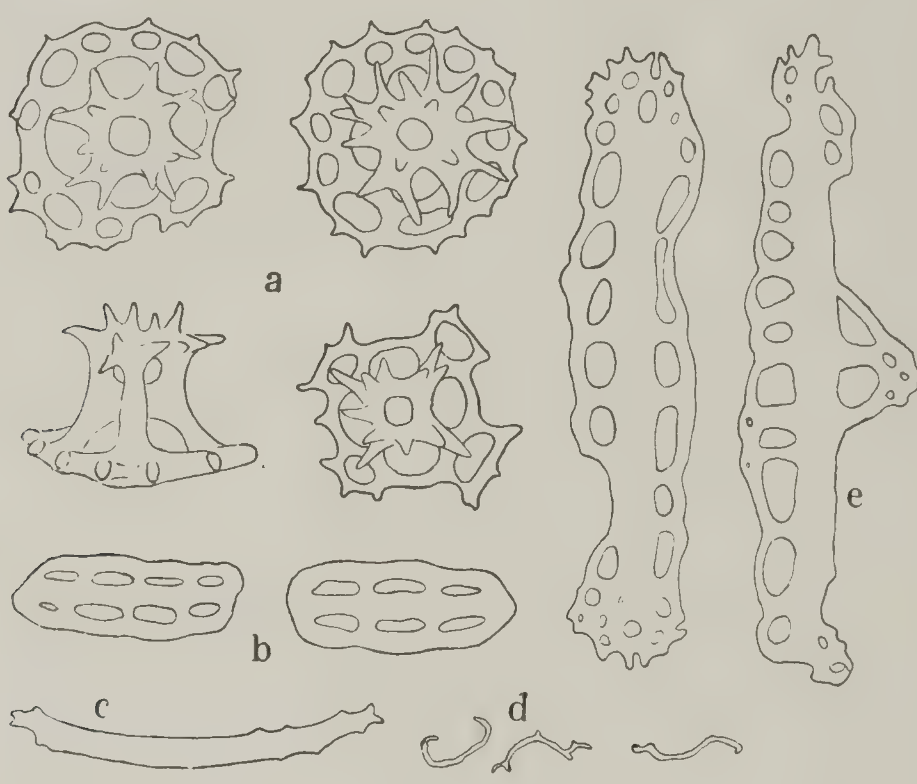


Fig. 23. Calcareous deposits of *Holothuria neozelanica*. a. Tables, from above and in side view; b. buttons; c. rod from tentacle; d. rods from the finer branches of the tentacles; e. spicules of tubefeet. a—b. 205/1; c—e. 150/1.

colour, whith indistinct small, white spots irregularly scattered. Ventral side hardly distinguishable. Suckers small, yellow, not serially arranged, scattered all over the body, only slightly more numerous on the ventral side. Apparently no papillæ on the dorsal side. Tentacles only 16, of medium size. Only 1 Polian vesicle; stone canals in a small bundle. Cuvierian organs present.

Calcareous deposits tables and buttons; both sorts very numerous, forming a close layer in the whole of the body. The tables (Fig. 23.a) are thorny along the edge of the disk; the crown carries some twelwe spines. The buttons (Fig. 23.b) smooth, with generally 6—8 holes. All sorts of irregularities in the buttons rather common. The spicules of the tubefeet rods with bilaterally arranged holes (Fig. 23.e). The larger spicules of the tentacles coarse, a

little spinous, slightly curved rods (Fig. 23.c); those of the finer branches quite irregular, thin, scarcely branched rods (Fig. 23.d).

Although the calcareous bodies are not of a very characteristic type, this species is rather unique through the exceptional number — 16 — of the tentacles, 18 (17) being otherwise the lowest number in the species hitherto known, with the sole exception of *Holothuria Heilprini* Ives from the Gulf of Mexico[1]) which is stated to have only 10 tentacles, and the rather problematical *Ananus holothurioides* Sluiter[2]), which is stated to have 13 tentacles. Of course, it is impossible to judge from the single specimen in hand whether the number of tentacles is constantly 16 in this species; but this number is, in any case, so unusually low that it is very probably not simply a variation of the usual number 20, but really a specific character of this form.

3. *Cucumaria brevidentis* (Hutton).

Thyone brevidentis.		Hutton. 1872. Catalogue N. Z. Echinoderms; p. 16.
Pentadactyla	—	Hutton. 1878. Notes on some N. Z. Echinod. Trans. N. Z. Inst. XI. p. 307.
Colochirus	—	Dendy. 1897. Observ. on the Holothurians of New Zealand. Journ. Linn. Soc. Zool. XXVI. p. 40. Pl. 5. Figs. 54—61.
—	—	Farquhar. 1898. Echinod. Fauna of N. Zealand. Proc. Linn. Soc. N. S. W. p. 325.
Cucumaria	—	R. Perrier. 1905. Holoth. antarctiques Mus. Paris. Ann. Sc. Nat. Zool. 9. Sér. I. p. 110.
—	—	Dendy & Hindle. 1907. Add. Knowl. N. Z. Holoth. J. Linn. Soc. Zool. XXX. p. 99.

1) I. E. Ives. Echinoderms from the Northern Coast of Yucatan and the Harbour of Vera Cruz. Proc. Acad. Nat. Sc. Philad. 1890. p. 318.

2) C. Ph. Sluiter. Über einige Holothurien von der West-Küste Java's. Natuurk. Tijdschr. voor Nederl. Indie. XL. 1880.

I would suggest that the explanation of this peculiar animal is this, that it is a specimen which has just been dividing itself. In E. Deichmann's record of the selfdividing *Actinopyga difficilis* ("On some cases of multiplication by fission and of coalescence in Holothurians". Papers from Dr. Th. Mortensen's Pacific Expedition. IX. Vidd. Medd. Dansk Naturh. Foren. Bd. 73. 1922) it is pointed out that the radial muscles on the division are cut straight off, much as it is seen in *Ananus* (comp. Fig. 2 of Deichmann's paper with Pl. III. Fig. 1 of Sluiter's paper); and also in *Actinopyga difficilis* the posterior end of the body is completely closed immediately after division, until a new anal opening is formed.

Non: *Colochirus calcareus* Dendy.
— — *brevidentis*. Ludvig. Holoth. d. Samml. Plate. Zool. Jahrb. Suppl. IV. p. 442. Taf. 26.22—29 (= *Cuc. calcarea.*)

Cape Maria v. Diemen; rocky coast, among algæ. 4. I. 1915. Several young specimens.

Slipper Island; the coast, at low water. 20/XII. 1914. 12 specimens, together with specimens of *Cuc. calcarea*.

Masked Island, Carnley Harbour, Auckland Isl.; on rockwall, among *Melobesia*. 3/XII. 1914. Several specimens.

The reasons for maintaining this species as different from *Cucumaria calcarea* (Dendy) are given under the latter species.

4. *Cucumaria brevidentis*, var. *carnleyensis* Dendy.

Cucumaria brevidentis (Hutton), var. *carnleyensis*. Dendy. 1909. On a small collection of Holothurians from the Auckland Island. The Subantarctic Islands of New Zealand. I. p. 149. Pl. VI.2.a—1.

Figure 8 Island, Carnley Harbour, Auckland Isl.; under stones, at low water. Several specimens. 2/XII. 1914.

Masked Island, Carnley Harbour, Auckland Isl. On rockwall, among *Melobesia*. 3/XII. 14. Numerous specimens, mainly young.

Perseverance Harbour, Campbell Island; under stones, at low water. 8/XII. 1914. 1 specimen.

Paterson Inlet, Stewart Isl., 5—15 fms. 1 young specimen. Another specimen from Stewart Isl., though without exact locality and date, was received from Prof. Benham, as also two specimens of this species, labelled Macquarie Island (wrongly identified as *Pseudopsolus macquariensis* (Dendy)) collected by Mr. A. Hamilton (see below, p. 335, 358).

The specimens from Masked Island were found in great numbers, together with the typical form and with *Cuc. leoninoides*, among the beautiful Melobesias, which were covering the vertical rockwall there. Mostly they were of a fine red colour, looking, indeed, like strawberries, as described by Dendy (Op. cit.). The specimens found under stones at the shore generally had some of the lateral tubefeet very much extended, the outline of the body becoming thereby often quite irregular, as if it were extended with needles. They were always rather flattened, closely appressed to the stones with their underside, which forms a fairly distinct sole.

The largest specimens have a size of 4—4.5 cm in a contracted state, thus, when fully extended, at least ca. 6 cm. The contracted specimens often have a very characteristic appearance trough the

body wall not closing above the retracted anterior end but forming a deep, round funnel, at the bottom of which the contracted tentacles are just seen (Fig. 24).

The colour is usually pink on the dorsal side, differing thus conspicuously from the typical form, which is dark, nearly black, at the anterior end on the dorsal side.

Those specimens from Masked Island, which I refer to the typical form, are well distinguished from the variety, besides by their dark, blackish colour, through the fact that the tubefeet of the dorsal radii are not scattered over the interradii, or at most in a very slight degree, while according to Hutton and Dendy they are scattered over the interradii in the typical *brevidentis*, as is the case in the var. *carnleyensis*. Thus it is not beyond doubt whether it is correct to refer these specimens to the typical *brevidentis*. As I have no larger specimens of the typical *brevidentis* from localities, where the variety does not occur, I am not in a position to give all the information wanted as regards the characters distinguishing the variety from the typical form. The calcareous deposits are alike in both, and in their internal anatomy there would appear to be no difference either.

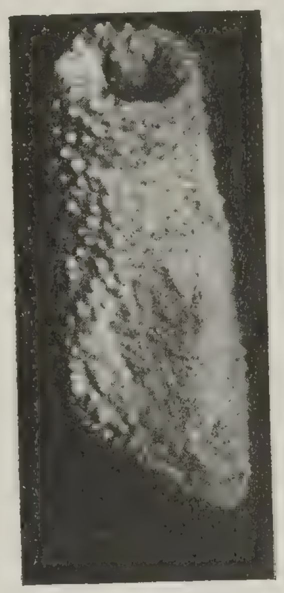
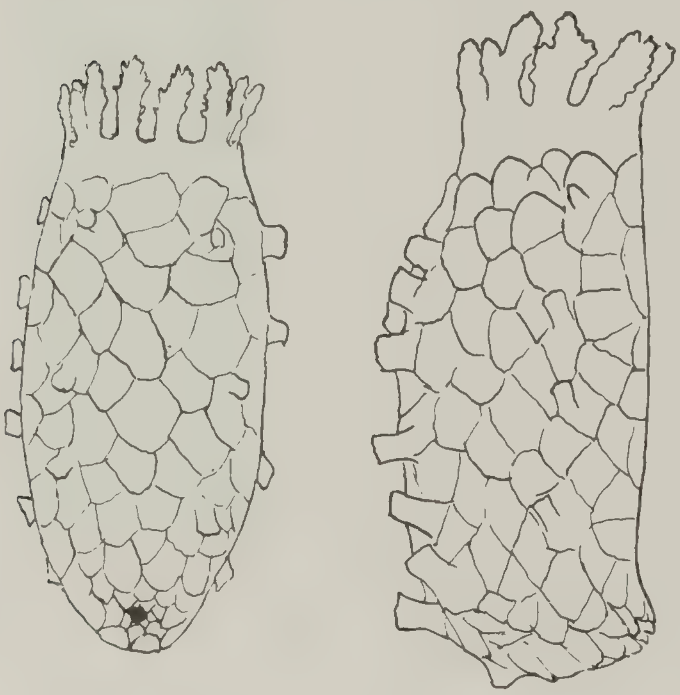


Fig. 24. *Cucumaria brevidentis*, var. *carnleyensis*. Large specimen in a contracted state. Nat. size.

Nevertheless, there can hardly be any doubt but that they represent two distinct forms, perhaps rather two separate species, the proof thereof being afforded by the young ones; my material of these consists of some specimens of the typical form from a size of 2 mm (from Cape Maria van Diemen, where the variety does not occur) and of numerous specimens from a size of only 1.5 mm of the variety (from Masked Island, Carnley Harbour). In the youngest specimens of the typical form the skin contains a number of larger, smooth plates of varying sizes, which do not fit together so as to form a close mail; the outer layer of the skin is full of the fine, delicate cups characteristic of the species. In the variety the skin contains similar smooth plates; but these are larger, of a uniform size, and fit together, partly even overlapping, so as to form a close mail, recalling the covering of a *Psolus* (Fig.

25.a—b). Further, the cups are as yet much less numerous than in the young of the typical form. This stronger development of the larger plates in the variety forms a very conspicuous character distinguishing the younger stages of the two forms. While in the variety they remain very distinct until a size of, at least 7—8 mm length, they are hardly discernible beyond the very youngest stages, 2—3 mm length, in the typical form.

The young stages also give interesting information about the successive development of the various sorts of calcareous corpuscules. In the smallest specimens, 1.5 mm long, of the variety the large plates alone are as yet developed. On the dorsal side the cups have just begun to form over the edges of the larger plates. At a size of ca. 3 mm length the cups form a close layer in the skin, outside the large plates, but the buttons have not yet made their appearance. This latter sort of corpuscules, which is thus the last to develop, does not make its appearance until later, when, at a size of ca. 6—8 mm length, the larger plates begin to draw apart from one another, so as to leave naked interspaces between them. In these interspaces the buttons are formed; it appears that no large plates are formed during the growth of the animal, the adult possessing only the same number of them as was found in the smallest young, and, consequently, while in the young specimens these large plates form a close mail, they lie widely scattered in the skin of the adult, discernible only as small spots, the skin being otherwise filled up with the small, knobbed buttons. — In the typical form, where the large plates do not form a close mail in the young stages the buttons begin to appear already at ca. 3—4 mm length. — Not rarely the large plates of the variety have a thickening at the overlapping point so as to be slightly spinous. Those around the anterior end are often somewhat prolonged so as to form valves



a. b.

Fig. 25. Young specimens of *Cucumaria brevidentis*, var. *carnleyensis*; a. from above; b. in side view. 12/1.

which close over the retracted tentacles. Also those around the anal opening are somewhat elongate, forming anal teeth; these latter remain, more or less distinct, also in the adult specimens.

The occurrence of this species at Macquarie Island is of considerable zoogeographical interest, and a striking parallel to the occurrence of *Pseudopsolus macquariensis* at Stewart Island, as recorded in the present paper. The coincidence is, however, so remarkable that I cannot withhold the suggestion that it might perhaps be due to an intermingling by the labelling, so that the *Pseudopsolus* came really from the Macquarie Isl., the *Cuc. brevidentis* from Stewart Island. In any case, I would not think it definitely proved that *C. brevidentis* occurs at Macquarie Island, and, inversely, *Pseudopsolus macquariensis* at Stewart Island, until new facts are available. It must be conceded, however, that such distribution is by no means unlikely; both forms being littoral they might easily be transported from one place to the other by means of the large algæ, among the roots of which they may live attached.

The statement of the occurrence at Juan Fernandez of *Cuc. brevidentis* (Ludvig. Op. cit.) is due to a mistake. The Juan Fernandez-specimens are really *Cuc. calcarea* Dendy (see under that species).

5. *Cucumaria calcarea* (Dendy).

Colochirus calcarea. Dendy. 1897. Observ. Holoth. N. Z. Journ. Linn. Soc. Zool. XXVI. p. 38. Pl. 5. 44—53.

— — Farquhar. 1898. Echinod. Fauna N. Z. Proc. Linn. Soc. N. S. W. p. 325.

— *brevidentis.* Ludvig. 1898. Holoth. d. Samml. Plate. Zool. Jahrb. Suppl. IV. p. 442. Taf. 26. 22—29.

Non: *Cucumaria brevidentis* (Hutton).

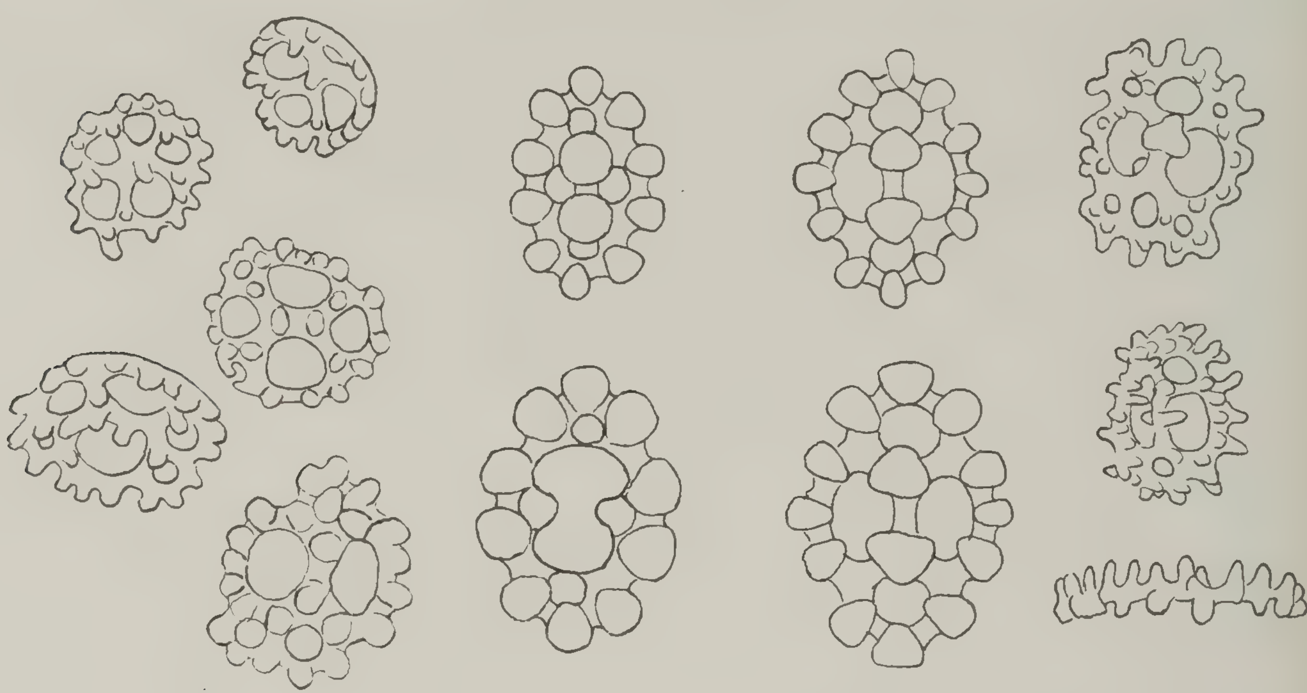
Slipper Island; the coast, at low water. 20/XII. 1914. 30 specimens, together with specimens of *Cuc. brevidentis.*

Paterson Inlet, Stewart Island; 5—15 fms. 17/XI. 1914. 1 specimen.

The largest specimen, from Slipper Island, is 20 mm long, the tentacles not retracted. The specimen from Stewart Isl. is of the same length, but very much contracted and accordingly was considerably larger in life, probably some 30 mm long.

Ever since Ludwig in 1898 (Op. cit.) declared Dendy's *Colochirus calcarea* to be identical with *Cuc. brevidentis* (Hutton) it

has been unanimously agreed by all authors dealing with these species, also by Dendy himself, that *C. calcarea* is nothing but a synonym of *brevidentis.* I am not inclined to agree with this, and think that only the fact that Dendy failed to emphasize in a sufficient way the differences existing in the calcareous deposits of



a. b. c. d.

Fig. 26. Calcareous deposits of *Cucumaria brevidentis* and *C. calcarea.* a. Cups, in various positions, b. buttons of *C. brevidentis*; c. buttons, d. cups, from above and in side view (lowermost figure) of *C. calcarea.* a. and d. $^{470}/_{1}$; b. and c. $^{200}/_{1}$.

the two species caused Ludwig and, after him, the other authors to deny the specific validity of *calcarea.*

In the general appearance it is certainly not easy to find characters to distinguish the two species, at least in a preserved state and rather poor condition, as are, unfortunately, my specimens. The only noteworthy difference which I can find is in the colour, *calcarea* being perfectly white, *brevidentis* generally of a faint blackish tint in the anterior end, mainly on the tentacles and the thinwalled, retractile part (the "introvert"). However, this colour is no quite constant feature in *brevidentis* and thus forms no quite reliable character. Whether any differences are to be found in the internal anatomy I am unable to ascertain on account of the unsatisfactory state of preservation of my material. In the shape of the calcareous ring I do not see any marked difference between the two forms. But then the calcareous deposits offer so marked and constant characters that one may always at a glance tell one species from the other (cf. Fig. 26).

The buttons of *C. calcarea* have the two lateral holes considerably larger than the terminal ones, while in *brevidentis* the holes are all of nearly the same size; upon the whole the buttons are more slender and elegantly shaped in *calcarea* than in *brevidentis*. Also the knobs along the edge of the buttons are more numerous (12) in *calcarea* than in *brevidentis* (10) (Figs. 26.b—c). This I find to be a perfectly constant character, and on looking over preparations of the calcareous deposits of the two species one cannot help being struck with the difference and it must seem impossible that specimens containing so strikingly different calcareous bodies could belong to one and the same species. (The figures represent the typical form of the buttons; forms with more holes and knobs, often rather irregular, are by no means rare, but also in these the original type is nearly always discernible). The buttons are also much more numerous in *calcarea* than in *brevidentis*, the skin being of quite a chalky consistence in the former. On the other hand, the larger plates of the skin are very much scarcer in *calcarea* than in *brevidentis*, sometimes apparently wholly wanting.

Further, the cups are different in the two species. In *calcarea* they are provided with numerous knobs on both sides, in *brevidentis* they are knobbed only on the upper side, the underside being smooth (Figs. 26, a, d).

From the description and figures of the calcareous bodies of the specimens from Juan Fernandez recorded by Ludwig under the name of *Coloch. brevidentis* it seemed very probable that these specimens really belonged to *C. calcarea* and not to *brevidentis*. Dr. W. Arndt of the Berlin Museum having kindly sent me one of these specimens I am in a position to say definitely that they are not *brevidentis;* the calcareous spicules agree completely with those of *calcarea* and thus the Juan Fernandez form must, for the present at least, be referred to *C. calcarea*. As it is a littoral form, which can be transported on floating algæ, the occurrence of the species at New Zealand and Juan Fernandez is not so very surprising. But it is to be expected that it will prove to occur also on the other subantarctic localities.

6. *Cucumaria leoninoides* n. sp.

Cucumaria leonina Semper. Var. Dendy. 1909. On a small collection of Holothurians from the Auckland Islands. The Subantarctic Isl.s of New Zealand. I. p. 146. Pl. VI.1.a—c.

Non: *Cucumaria leonina* Semper.

Masked Island, Carnley Harbour, Auckland Isl. On rock wall with Melobesia. 30/XI—3/XII. 14. Numerous specimens.

Figure 8 Island, Carnley Harbour, Auckland Isl ; under stones, at low water. 2/XII. 14. Several specimens.

Perseverance Harbour, Campbell Isl.; under stones, at low water. 9/XII. 14. 5 specimens.

1 Mile E. of the Auckland Isl., on floating Lessonia. 28/XI. 14. 2 specimens.

No doubt this species is nearly related to the South American *Cucumaria leonina* Semper, to which it was referred by Dendy, who regards it, at most, as a variety of this species. There can, however, in my opinion, be no question but that the New Zealand form is a perfectly distinct species, which I shall designate as *Cuc. leoninoides*, this name hinting both at its history and its affinity with the South American species. Otherwise, it bears also distinct relations to the Kerguelen form, *Cuc. lævigata* (Verrill), from which it differs, however, conspicuously in not being brood-protecting.

A detailed description is given by Dendy and thus need not be given here again; it may suffice to point out the characters which distinguish this species from *C. leonina*.[1])

The calcareous deposits are of the type characteristic of *C. leonina* and related species, and are arranged in the same way: the serrate end of the plates overlapping and making the skin just a little bit rough or, as seen in the microscope on cleared up pieces of skin, even finely spinous. However, they are well distinguished from those of *leonina*, being considerably broader and with a larger number of holes outside the four primary ones (Fig. 27.a to com-

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1) Dendy expresses, with full right, I think, serious doubts as to the correctness of regarding Semper's *Cucumaria dubiosa* and *Cuc. leonina* as one and the same species, as is done by Ludwig, Lampert and Perrier. This question does not, however, concern us here directly. The name chosen for the Auckland Isl. species will be appropriate, even in case it is ultimately proved that the two said species are not identical and that the South American species should be named *Cucumaria dubiosa* Semper, the relation to the true *leonina* being equally close.

pare with Fig. 27.c, representing such body from *C. leonina*). Further, no other sort of plates occurs in the skin of the New Zealand species, a conspicuous difference from *C. leonina*, in which latter species plates, not drawn out into a serrate point (buttons), occur in considerable number, among those of the above mentioned form. The calcareous

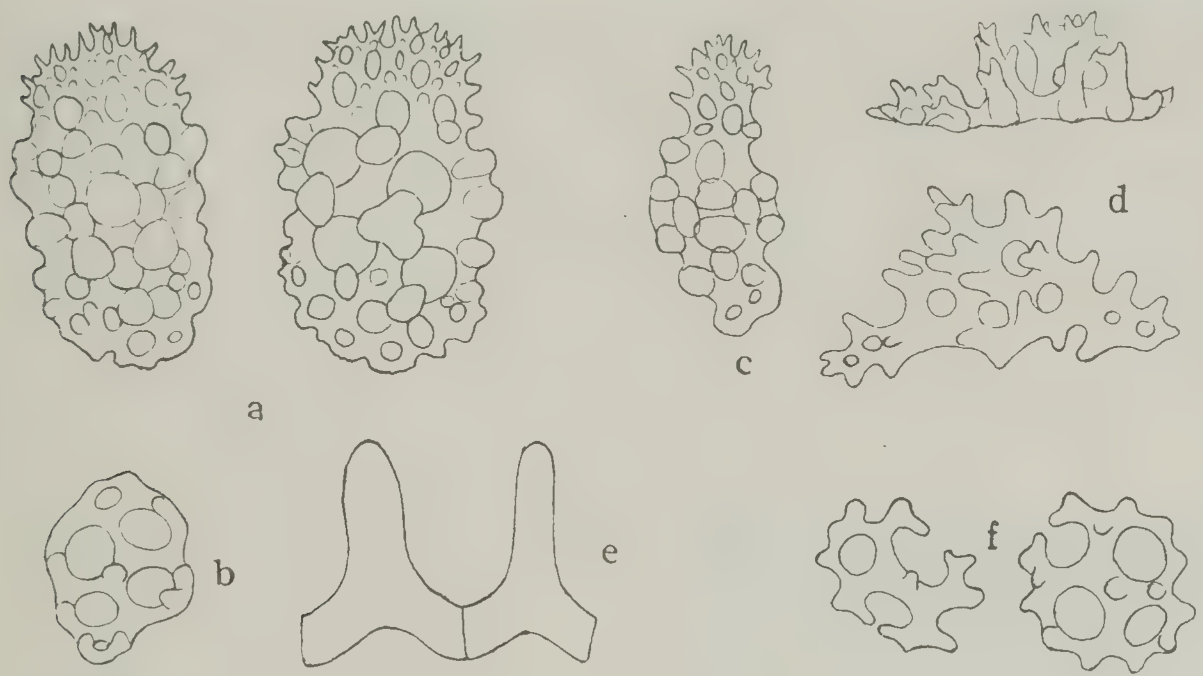

Fig. 27. Calcareous deposits from the skin (a) and the introvert (b) of *Cucumaria leoninoides*; from the skin (c) and the introvert (d) of *C. leonina;* radial (left) and interradial (right) of calcareous ring of *C. leonina* (e); cups of "*Ocnus vicarius*" (f). a—d. $^{165}/_{1}$; e. $^{10}/_{1}$; f. $^{390}/_{1}$

bodies of the thin-walled "introvert" are nearly smooth plates, not serrated in one end; in *leonina* these plates are a sort of rudimentary tables, as stated by Ludwig. This is, again, a conspicuous difference between the two species (Figs. 27.b and d).

Finally, the large, smooth plates found in the deeper layer of the skin in *C. leonina* appear to be wholly wanting in the New Zealand species.

In the interior anatomy there is an important difference in the number of the Polian vesicles, there being constantly two in the New Zealand species, 3—4 in *leonina*. It is a curious fact that the oesophagus is often protruded through the mouth on preservation, looking like a long proboscis. — On opening specimens of *leoninoides* reddish-yellow oil drops are seen to flow out; the intestine and genital organs are orange-coloured, as is the whole inside of the body, on account of the thick, yellowish peritoneal layer which covers it all. This gives a striking impression of the specimens being very fat.

The largest specimens are 35 mm long, preserved in a well extended state, the thickness only 5 mm. The youngest specimens found are 3 mm long. Great numbers of this species were found, together with *C. brevidentis*, var. *carnleyensis*, among the leaves of *Melobesia antarctica* on the steep rockwall of Masked Island in Carnley Harbour, the body being pressed in between the leaves of the algæ, only the anterior end protruding (Fig. 28). Although I have made no notice of the colour of the living specimens I mean to remember fairly clearly that it was yellowish-white, as it is in the preserved specimens. A more or less distinct reddish spot is found on the oral disk at the base of each pair of tentacles.

I may take the opportunity here of saying a few words about *Ocnus vicarius* Bell. This species was stated by Lampert[1]) to be a synonym only of *C. leonina*, which has been unanimously accepted by all the authors dealing with these forms after him. On looking up the description and figures given by Bell[2]) of his *O. vicarius* I could not help doubting the correctness of identifying it with *C. leonina* and therefore applied to Dr. C. C. Monro, who very kindly sent me a small piece of skin of the type of *O. vicarius*. The examination of the calcareous deposits shows beyond any doubt that it is not a synonym of *C. leonina*. The figures given by Bell are perfectly correct and show that there is no thorny prolongation on the calcareous bodies, such as is characteristic of *leonina*. Further, I find that besides the two sorts of bodies figured by Bell there are also numerous small cups (Fig. 27.f) lying in the epidermis, this latter sort lacking entirely in *C. leonina*.

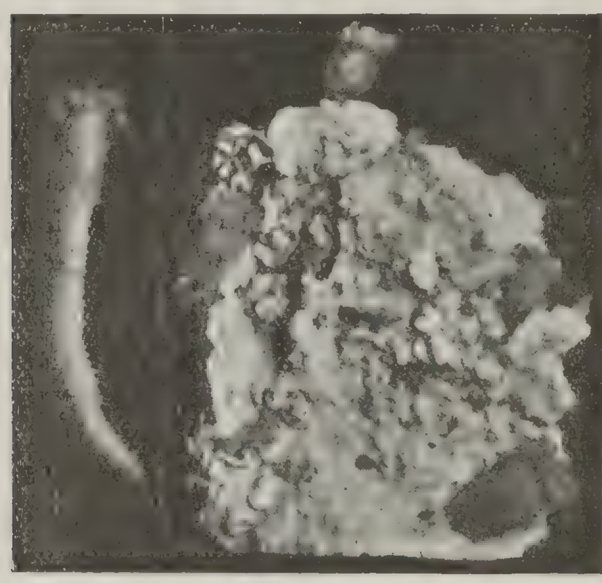

Fig. 28. *Cucumaria leoninoides*; a wholly expanded specimen (to the left) and some specimens in a piece of Melobesia. Nat. size.

[1]) K. Lampert. Die während d. Exped. S. M. S. "Gazelle" 1874—76 von Prof. Th. Studer gesammelten Holothurien. Zool. Jahrb. Abt. f. Syst. IV. p. 826.

[2]) F. Jeffr. Bell. Studies in Holothurioidea. II. Descriptions of new species Proc. Zool. Soc. 1883. p. 59. Pl. XV.$_2$.

Accordingly it is out of question that *O. vicarius* could be identical with *C. leonina*. As a matter of fact it is nearly related to *C. brevidentis*, perhaps identical with that species. The difference seen in the cups of *brevidentis* and *vicarius* (Fig. 26.a, 27.f) is not so important, samples with equally numerous cups as in *vicarius* being also found in *brevidentis;* the fact that the cups of *vicarius* are knobbed only on the outer side, as in *brevidentis*, is of more importance.

Since the type of *O. vicarius* had no locality, it will hardly be possible ever to recognize the species with full certainty. Still it is a simple act of justice towards this much criticized author to point out that in this case it was his critics, who were wrong.

7. *Cucumaria amokuræ* n. sp.

Carnley Harbour, Auckland Island; 45 fms. Sandy mud. 6/XII. 1914. 4 specimens.

Paterson Inlet, Stewart Island; 5—15 fms. Mud. 17/XI. 1914. 2 specimens.

The largest of the specimens from Carnley Harbour (the type), measures 9 mm in length, by 5 mm in thickness (the tentacles retracted). One of the specimens from Stewart Island is 11 mm long, by 8 mm thick, strongly contracted; this specimen would probably be about 20 mm long when fully expanded. The shape of the body is sausage-shaped, whith rounded ends. In the smaller

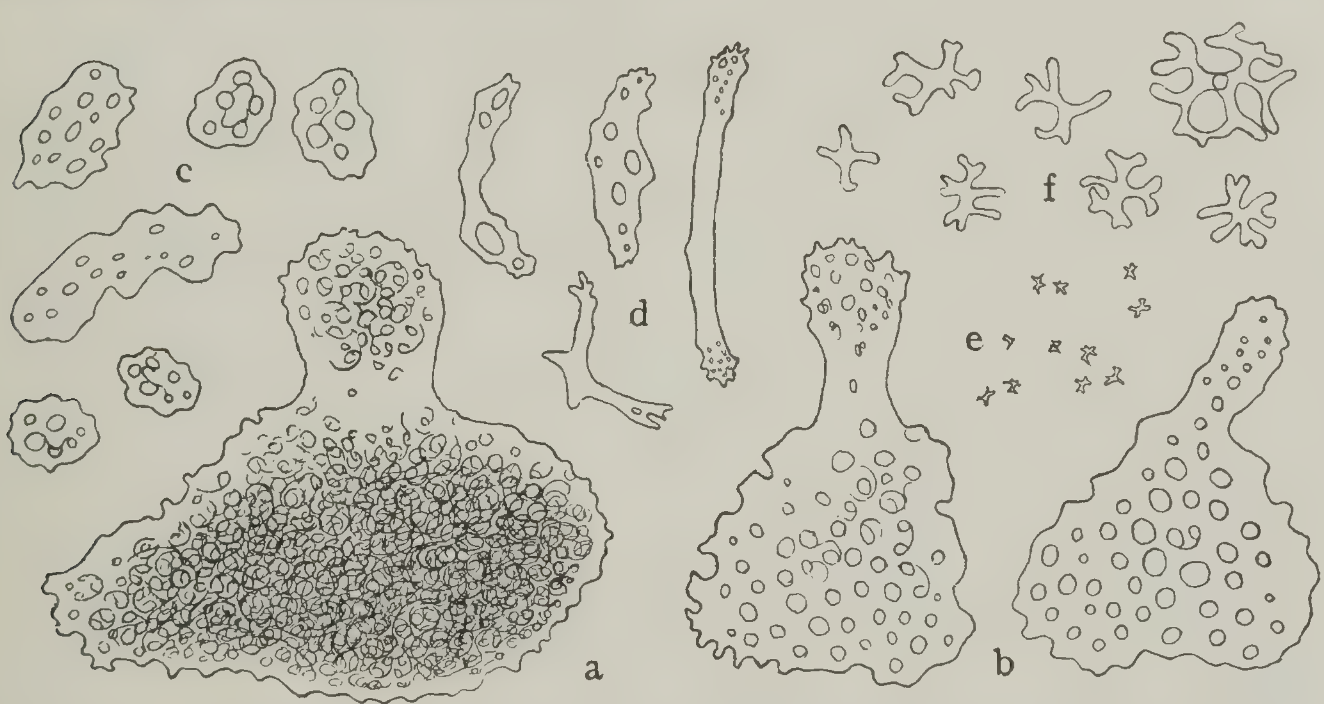

Fig. 29. Calcareous deposits of *Cucumaria amokuræ*.
a. Large scale from the dorsal side; b. from the sides of the body; c. buttons; d. rods from the tubefeet, the longer one to the right from a tentacle; e. small x-shaped bodies (cups); f. the same more enlarged. a—e. 66/1; f. 300/1.

specimens, which have the tentacles expanded, the anterior end is bent slightly upwards. Anus subdorsal.

The ventral pair of tentacles distinctly smaller than the others. Tubefeet of the trivium in two rather close series; those of the bivium also biserial, but rather distant; a few scattered, small tubefeet may be found in the middorsal interradius. The skin is rather delicate on the ventral side, hard and rough on the dorsal side, in correspondance with the different development of the calcareous bodies in the bivium and the trivium. The epidermis is very thin and delicate, somewhat slimy, mud-particles being often fastened to it. The calcareous deposits are of two (or three) kinds. In the epidermis are found numerous very fine x-shaped bodies, somewhat irregular, only ca. 0.03 mm (Fig. 29.e—f). More rarely some of the branches are coalesced; such cases make it evident that these bodies must be regarded as rudimentary cups. The deposits of the deeper layer of the skin are larger plates of various forms. In the ventral part of the body they are simple, smooth and lie more or less widely apart. Towards the sides of the body they gradually become somewhat dorsad produced (Fig. 29.b); in the dorsal part of the body these plates are very large and coarse, scale-like, the prolongation forming a coarse, erect spine (Fig. 29.a). The plates are overlapping with their edges, the overlapping edge looking white, whereas the rest of the plate remains transparent; this gives the dorsal side of the skin a curious aspect of being coarsely reticulate. — In the larger specimen from Stewart Island numerous small, smooth or slightly knobbed plates (buttons, Fig. 29.c), are found along the edges of the larger plates, or in the interspace between the latter, in the places where these do not lie so close together.

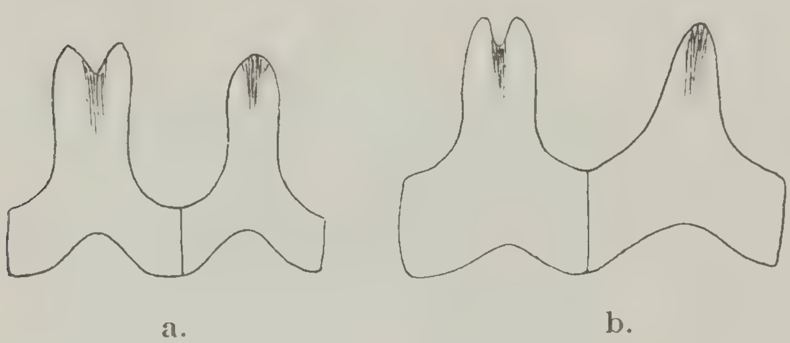

Fig. 30. Radial and interradial from calcareous ring of *Cucumaria amokuræ* (a) and *C. Farquhari* (b). 22/1.

The deposits of the tubefeet are of the usual shape, elongate, slightly branched rods (Fig. 29.d). Those of the tentacles are considerably larger. Anal teeth not distinct.

The calcareous ring well developed, both radial and interradial pieces with an anterior prolongation (Fig. 30.a). There is one Polian vesicle and one stone canal. Genital tubes short, unbranched. Oesophagus without muscular thickening. The retractors are attached about in the middle of the body.

Colour of the living specimens yellowish, in alcohol white. The larger specimen from Stewart Island is reddish.

This species does not appear to be more nearly related to any species hitherto known.

8. *Cucumaria Farquhari* n. sp.

2 Miles E. of North Cape, N. Z. 55 fms. Hard bottom. 2/l. 1915. 2 specimens.

The larger specimen, which is well extended, measures 13 mm in length, by about 4 mm in thickness. The shape of the body is about cylindrical, the ventral side, however, more or less flattened; a short, upwards turned tail end. The anterior end not upwards turned.

The ventral pair of tentacles distinctly smaller than the rest of them. The tubefeet of the trivium arranged in fairly regular double series along each radius; they are, however, developed only in the main part of the body, lacking entirely in the anterior and posterior end. The part carrying the tube feet thus forms a more or less pronounced sole. Tubefeet entirely lacking on the dorsal side.

The calcareous deposits are of three kinds: large, coarse, overlapping scales, buttons and small cups. The large scales, which make the thick skin hard and rough, show a peculiar structure: smooth, rounded, somewhat elevated knobs, surrounded by smaller holes, connected by narrow tubes or canals (Fig. 31.a); in the anterior and posterior part of the body and on the dorsal side they are prolonged into a short, prominent thorn, which gives rather the impression of a grain; in fact, the body covering recalls the grainy scaling of a *Psolus*. Towards the anal opening the thorn of the scales becomes somewhat more elongated; the anal teeth rather indistinct on account of these thorns. On the ventral side the plates are not thus prolonged into a thorn. The buttons (Fig. 31.b), which have a few round knobs, are found mainly along the edges of the larger plates. The cups (Fig. 31.d—e), which lie in great numbers in the epidermis, are somewhat spinous, with rounded thorns. The

spicules of the tubefeet (Fig. 31.c) are of the usual type, as are also those of the tentacles. It is worth noticing that cups are also found in the walls of the tubefeet, nearly up to the sucking disk, which latter is provided with a well developed end-plate.

The calcareous ring is rather stout (Fig. 30.b); the posterior notch is rather deeper in the interradials than in the radials. There is one Polian vesicle and one stone canal. The retractor muscles are attached about in the middle of the body. The oesophagus is very short and somewhat muscular immediately behind the water vascular ring. The genital coeca are short, unbranched, containing only a few, large, oval eggs, and having a somewhat moniliform appearance.

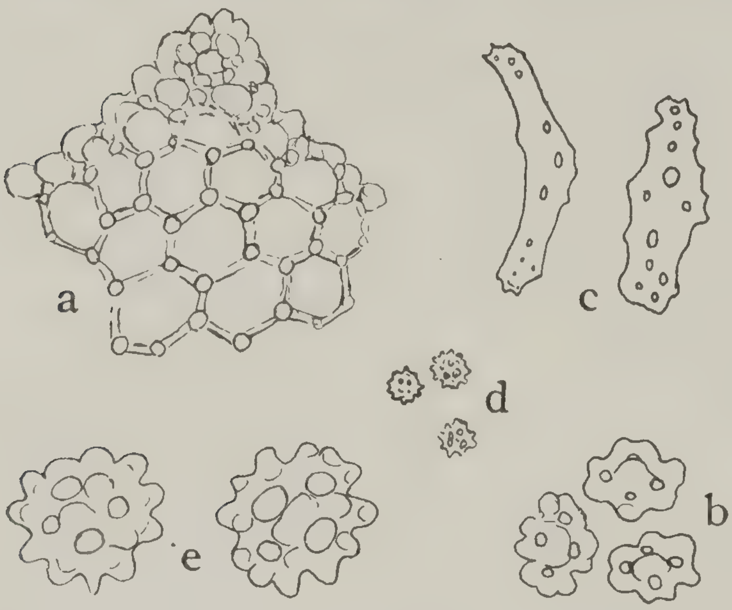

Fig. 31. Calcareous deposits of *Cucumaria Farquhari*. a. Part of a large scale; b. buttons; c. spicules of tubefeet; d. cups; e. same more enlarged. a. 80/1; b—d. 44/1; e. 360/1,

The larger specimen is slightly blackish on the dorsal side, especially at the anterior and posterior end, otherwise white.

This species bears a considerable resemblance to the Japanese species *Cucumaria tegulata* Augustin (— which has, I do not think justly, been declared synonymous with *C. capensis* Théel —). The shape and size is very much the same, as is also the arrangement of the calcareous deposits, while the shape of the latter shows minor, but distinct specific differences. The main difference is, however, found in the arrangement of the tubefeet; while in the New Zealand species these are confined to the trivium, and even here are lacking in the anterior and posterior part of the body, in the Japanese species the tubefeet are found in all the radii, in the whole length of the body. But also in the latter species they are much more numerous in the middle part of the trivium, which has somewhat the appearance of a sole. The step from the condition found in the Japanese species to that found in the New Zealand species is, in reality, not very great, though of great interest from a morphological and a classificatory point of view.

I have the pleasure of dedicating this interesting species to

Mr. Farquhar, to whom science is indebted for so many valuable contributions to the knowledge of the New Zealand Echinoderm fauna.

9. *Cucumaria Bollonsi* n. sp.

Cape Maria van Diemen; among algæ on the rocky shore. 4/I. 1915. 6 specimens (together with *C. brevidentis*).

The largest specimen, which is strongly contracted, measures only 5 mm in length, by 3 mm in thickness. The rest of the specimens are quite young, only 3—4 mm long, fully extended.

The body simply sausage-shaped, anterior or posterior end not upwards turned. The ventral pair of tentacles much smaller than the rest of them. Tubefeet of the trivium in close, double series, in the largest specimen even with an indication of a pluriseriate condition in the lateral radii; this, however, is probably due only to the strong contraction of the body. In the bivium the tubefeet are arranged in a rather distant double series along each radius, and some smaller scattered ones are found also in the middorsal interradius.

The skin is very delicate and thin, and contains three sorts of calcareous deposits: plates, buttons and cups. The plates (Fig. 32.a) are small and perfectly smooth; they are found only very sparingly so as not at all to lend any strength to the skin. Somewhat more numerous are the buttons (Fig. 32.b), which are small, ovoid, typically with four holes and now and then a few smooth knobs; they may occur also in the walls of the tubefeet and generally lie like a wreath round the retracted dorsal feet. In young specimens the buttons are very scarce, while the plates are a little more numerous. In the larger specimen it is just the inverse, evidently because no new plates are formed, while new buttons are developing later on, during growth. By far the most numerous sort of calcareous bodies are the cups, which are very characteristic. In the main they are x-shaped bodies, more or less irregular (Figs. 32.c); in a few of them the branches coalesce so as to show them to be rudimentary cups. Around the anal opening are larger plates, forming rather distinct anal teeth. The spicules of tubefeet and tentacles of the ordinary type (fig. 32.d); the sucking disk is provided with a large round end-plate.

The calcareous ring is well developed, about as in *C. amokuræ*. There is one Polian vesicle and one stone canal. A muscular thickening of the very short oesophagus is indicated, immediately behind the watervascular ring. The retractor muscles are attached about midway in the body. The genital organs are short, unbranched tubes. They contain fairly large eggs in the larger specimen, which must then be supposed to be nearly adult.

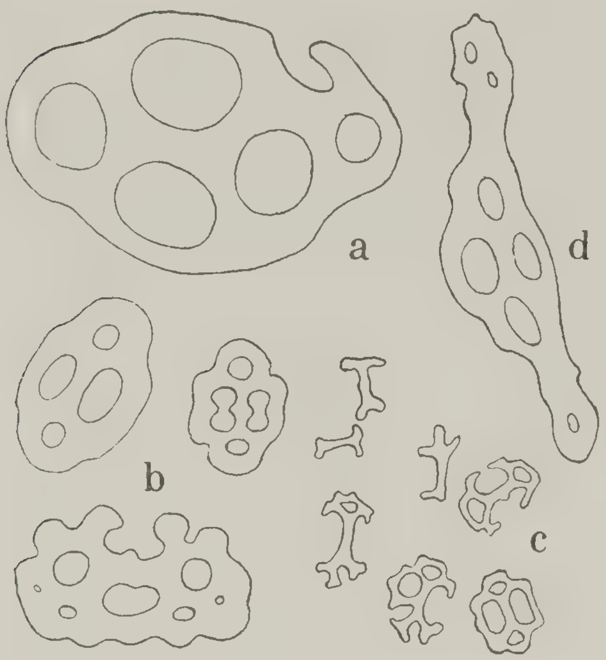

Fig. 32. Calcareous deposits of *Cucumaria Bollonsi*. a. Plates; b. buttons; c. cups; d. spicule of tubefoot. 230/1.

The colour of the larger specimen is blackish on the dorsal side, otherwise white; the young ones are white.

The species appears to bear some relation to *Cucumaria parva* Ludwig, from which it is, however, very easily distinguished through its calcareous bodies. Whether it is viviparous, as *Cuc. parva*, or not, remains to be seen, the single nearly adult specimen being, of course, insufficient for giving definite proof of this.

I dedicate this characteristic species to Captain Bollons, who, through his zeal and interest in dredgings, has done so much to promote the knowledge of the marine fauna of New Zealand.

10. *Cucumaria alba* (Hutton).

Chirodota ? alba.		Hutton. 1872. Catalogue N. Z. Echinod., p. 17.
Echinocucumis alba.		Hutton. 1878. Notes on some N. Z. Echinod. Trans. N. Z. Inst., XI. p. 307.
Colochirus	—	Dendy. 1896. Observ. Holoth. New Zealand. Journ. Linn. Soc. Zool. XXVI. p. 35. Pl. 4. 21—32.
—	—	Farquhar. 1898. Echinoderm Fauna of N. Z. Proc. Linn. Soc. N. S. W. p. 325.
Cucumaria	—	Ludwig. 1898. Holothurien d. Hamburg Magalh. Sammelreise; p. 29.
—	*Filholi.*	R. Perrier. 1903. Sur deux nouvelles espèces d'Holothuries de la Nouv.-Zélande. Bull. mus. d'hist. nat. p. 144.
—	*alba.*	R. Perrier. 1905. Holoth. antarct. Mus. d'hist. nat Paris. Ann sc. nat. Zool. 9. Sér. I. p. 85.

Cucumaria Filholi.	R. Perrier. 1905. Ibidem; p. 88. Pl. V. 10—12.
— *alba.*	Dendy & Hindle. 1907. Add. Knowl. N. Z. Holoth. Journ. Linn. Soc. Zool. XXX. p. 98.

Colville Channel, 35 fms.; sandy mud. 21/XII. 1914. 3 specimens.
Tiri-Tiri, 15 fms.; mud. 28/XII. 1914. 4 specimens.
Paterson Inlet, Stewart Island; 5—15 fms.; mud. 17/XI. 1914. 2 specimens (in very poor condition).

Further, I have received from Captain Bollons some specimens from Cloudy Bay, 19 fms. Also some specimens from Akaroa Harbour were received previously from Mr. Suter.

I have nothing to add to the descriptions of the authors quoted, except mentioning that the eggs are unusually small for a Dendrochirote, only ca. 0.2 mm, and lie crowded in the genital coeca, in marked contrast especially to *Cucumaria Farquhari*, with its few, more than 1 mm long (oval) eggs lying, bead-like, in a single series in the genital tubes. This must mean a conspicuous difference in their development; one is even tempted to suggest that *Cuc. alba* may perhaps have typical pelagic larvæ, though such are otherwise unknown in the order of the Dendrochirota.

Concerning the *Cucumaria Filholi* of Perrier I agree perfectly with Dendy & Hindle that there is not the slightest reason or possibility for regarding it as distinct from *C. alba*; it cannot even be maintained as a separate variety.

The new localities, Tiri-Tiri, Colville Channel and Stewart Island, given here indicate that this species will prove to occur along the whole of the New Zealand coasts, while it is not known to occur outside the New Zealand region.

11. *Cucumaria ocnoides* (Dendy).

Colochirus	*ocnoides.*	Dendy. 1896. Observ. Holoth. New Zealand. Journ. Linn. Soc. Zool. XXVI. p. 36. Pl. 4. 33—43.
—	—	Farquhar. 1898. Echinod. Fauna N. Z. Proc. Linn. Soc. N. S. W. p. 325.
Cucumaria	—	Ludwig. 1898. Holoth. Hamburg. Magalh. Sammelreise; p. 30.
Ludwigia	—	Reiffen. 1901. Über eine neue Holothuriengattung. Zeitschr. wiss. Zool. LXIX.
Cucumaria	—	Perrier. 1905. Holothuries antarct. Mus. d'hist. nat. Paris. Ann. Sc. nat Zool. 9. Sér. I. p. 96. Pl. I.9—13, Pl. V.13.

Cucumaria ocnoides. Dendy & Hindle. 1907. Add. Knowl. N. Z. Holoth. Journ. Linn. Soc. Zool. XXX. p. 100.

Wellington Harbour, 5—10 fms. 16/II. 1915. 1 large specimen (posterior half only). I have further received a small specimen from Captain Bollons, dredged in Cloudy Bay, 19 fms. Also, I have a fragment (anterior end) of a specimen from Akaroa Harbour, from Mr. Suter.

The species being hitherto known only from the type-locality, off New Brighton, the new localities given here somewhat extend the area of its distribution. There can, however, hardly be any doubt that it will prove to have a much wider distribution in New Zealand seas.

To the descriptions given by the authors quoted I would add only one point, viz. that the cups of the epidermis produce a very characteristic grainy appearance of the scales. When this is not seen, as in some specimens from New Brighton Beach in hand, it is due, evidently, to the cups having been rubbed off.

I perfectly agree with Perrier and Dendy & Hindle in rejecting the genus *Ludwigia* established by Reiffen (Op. cit.) for this species. It is perfectly evident that this species is closely related to *Cucumaria alba,* though quite distinct from the latter species. Of course, it is highly probably, that, when once a thorough revision of the whole genus *Cucumaria* is undertaken — or rather of all the Cucumariidæ — a number of separate genera will have to be established, and then also forms like *alba* and *ocnoides* will be removed from the genus *Cucumaria* in a restricted sense. But such revision will be a very great task, which can only be accomplished by a competent specialist in this group, and not by some young student, who gets some little material from his Professor with the object of making his doctoral thesis of it.

For the rest I may call attention to the fact that the name *Ludwigia* is preoccupied for a longicorn beetle (Pic. Matériaux pour servir à l'étude des Longicornes. I. 1891, p. 47).

12. *Cucumaria Huttoni* Dendy.

Cucumaria Huttoni. Dendy. 1896. Observ. Holoth. N. Z. Journ. Linn. Soc. XXVI. p. 32. Pl. $3_{.19-20}$.

Cucumaria Huttoni. Ludwig. 1898. Holoth. Hamburg. Mag. Sammelreise. p. 39.
— — Farquhar. 1898. Echinod. Fauna N. Z. Proc. Linn. Soc. N. S. W. p. 324.
— — R. Perrier. 1904. Holoth. Antarct. Mus. d'hist. nat. Paris. Ann. Sci. nat. Zool. 9. Sér. I. p. 93.

1 specimen from Portobello (Otago Harbour), received from Prof. Benham.

Fig. 33. *Cucumaria Huttoni* Dendy. Natural size.

The specimen, which has the tentacle-crown very finely expanded (Fig. 33), while the body itself appears to be rather contracted, measures ca. 175 mm in total length. It is strongly curved, with a swollen median part and a narrower anterior and posterior part, both upwards directed; these three parts of the body are of about equal length. In the middle part the tubefeet, which are completely retracted, form three distinct, fairly regular double series in the trivium, the two series of each radius being rather distant; in the dorsal radii the tubefeet are much more inconspicuous, being much more scarce, and form only a single, irregular zigzag-series. But the existence of tubefeet in the dorsal ambulacra is important to

notice, in view of the fact that both Dendy and Ludwig failed to discover them. Probably Perrier has seen them, as he states to have found tubefeet in the lateral regions of the dorsal side; in fact, the dorsal ambulacra are nearer the ventro-lateral ambulacra than to the dorsal midline in the swollen middle part of the body, while in the anterior and posterior body parts all the ambulacra are equidistant. Thus, in the middle part of the body the middorsal interradius is unusually broad. In the anterior and posterior body parts the ambulacra form very conspicuous furrows, apparently wholly devoid of tubefeet, excepting the base of the posterior part, where a few tubefeet are distinctly seen. The introvert is wholly without tubefeet. The tentacles of equal size. No anal papillæ.[1])

The calcareous deposits, according to Dendy, would appear to be only of one kind, but of various size. Ludwig states that there are larger scales of an elongate-oval shape, upto 1 mm long, between and below which are lying very numerous, smaller, rounded plates of various sizes, conform to the figure given by Dendy. Perrier appears to have observed only the one form figured by Dendy. In the specimen examined by me the calcareous deposits are of two distinct kinds. The larger form (Fig. 34) is elongate-oval, or even rectangular in shape, formed by a very close meshwork of the sort usual in the thicker plates of Echinoderms. But these plates are bent, saddleshaped, one end implanted deep in the

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[1]) Ludwig has found a circle of cylindrical anal papillæ in two broken off caudal portions, which he refers to this species, while he did not observe any anal papillæ in his two complete specimens; he therefore suggests that in these apparently complete specimens the point of the tail end had really been lost. The explanation of this discrepancy (— also Dendy, who has studied a fresh specimen, states that there are no anal papillæ —) is this that the two tail ends examined by Ludwig were not of *C. Huttoni*, but of *C. ocnoides*, in which latter there is a circle of cylindrical papillæ around the anal opening. I am in a position to offer this explanation not as a suggestion, but as a fact, having had, through the kindness of Professor R. Hesse, Bonn, the said objects for direct comparison with my specimens.

The tail end of *C. ocnoides* appears to be liable to break off, when the animal which, evidently, lies buried deep in the ground, with the ends just protruding above the bottom surface, is hit by the dredge. Also the present author has obtained such a broken off tail end of this species in the dredge.

skin, the other end protruding; these protruding ends, which are finely spinulose, overlap, and these are the scales to be seen in the skin which produce the scaly appearance distinct even to the naked eye. Furthermore the arrangement of these scales is fairly regular, transverse to the longitudinal axis of the body, and thus

Fig. 34.

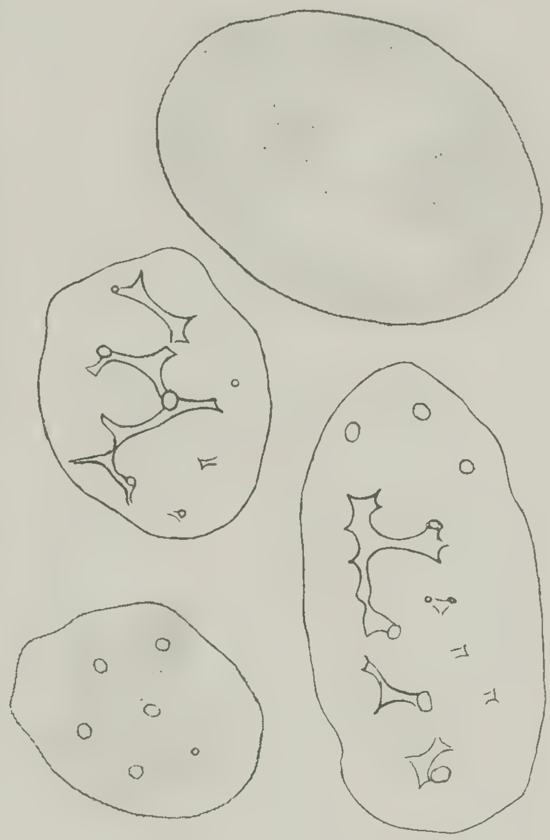


Fig. 35.

Fig. 34. Part of skin of *Cucumaria Huttoni*, showing the large, saddle-shaped plates and the small buttons. $^{85}/_{1}$. Fig. 35. Buttons of *Cuc. Huttoni*. $^{170}/_{1}$.

that from the ventral midline they imbricate towards the dorsal side, meeting from the two sides in the dorsal midline. This arrangement becomes less distinct towards the ends of the body, and at the tail end they all imbricate caudad. Between these larger scales the skin is filled up by a great number of small, oval or round plates of the structure described by Dendy and Perrier, measuring ca. 0.1—0.3 mm in greatest diameter. The holes in them are few and small and may entirely obliterate, leaving only fine concentric lines, the plates representing then small, glassy buttons (Fig. 35). Also along the edges fine concentric lines are often seen.

The introvert is entirely without calcareous deposits. The tube-feet are, as stated by Ludwig, entirely devoid of calcareous deposits, excepting the small terminal disk. The tentacles contain ir-

regular plates of various size. — The introvert is irregularly spotted with small yellowish-brown spots; such may also be observed on the tentacles.

In the internal anatomy the only difference from the type appears to be the existence of 5 long and slender Polian vesicles, while Dendy found only two of them and Ludwig even only one.

The differences in the calcareous deposits which, according to the above description, exist between this specimen and those described by the three authors quoted are rather conspicuous, it is true. However, it seems perfectly clear that the discrepancies do not mean real differences between the various specimens described. From Ludwig's description it would seem that he has found them very nearly as here described. Unfortunately, his specimens, as I am informed by Professor R. Hesse, are not to be found and thus a reexamination has not been possible. On the other hand I have had from the Museum of Vienna, through the kindness of Professor C. Attems, one of the specimens of Perrier for reexamination, and it proved to agree very well with my specimen, the only difference being that the large, imbricating scales do not show the same regular arrangement. Also the small plates are somewhat different, being less glassy, with more holes than in my specimen. Of course, it would be desirable to have the type specimen also reexamined. But until that has been done and direct proof has been given that it does not agree with the specimens examined by Perrier and myself, being devoid of the large scales, I must refer, in accordance with Perrier and Ludwig, these specimens to *Cucumaria Huttoni.*

13. *Phyllophorus longidentis* (Hutton).

Thyone longidentis. Hutton. 1872. Cat. Echinod. N. Z. p. 16.
— *caudata.* Hutton. 1872. Ibidem; p. 16.
Peutadactyla longidentis. Hutton. 1879. Notes on some N. Z. Echinod. Trans. N. Z. Inst. XI. p. 307.
Thyone — Théel. 1886. "Challenger" Holoth. II. p. 141.
Thyonidium rugosum. Théel. Ibidem, p. 95, Pl. V.5.
— *caudatum.* Théel. Ibidem, p. 147.
— *longidentis.* Dendy. 1896. Observ. Holoth. N. Z. Journ. Linn. Soc. Zool. XXVI. p. 42. Pl. 6. 62—69.
— — Farquhar. 1898. Echinod. Fauna N. Z. Proc Linn. Soc. N. S. W. p. 326.

Phyllophorus longidentis Ludwig. 1898. Holoth. Hamburg. Mag. Sammelreise; p. 49.
Thyonidium anatinum. R. Perrier. 1903. Sur deux esp. nouv. d'Holoth. Nouv. Zélande. Bull. Mus. d'hist. nat. Paris. p. 142.
Phyllophorus anatinus. R. Perrier. 1904. Holoth. antarct. Mus. d'hist. nat. Paris. Ann. Sc. nat. Zool. 9. Sér. I. p. 112. Pl. V.1,9.
— *longidentis.* Dendy & Hindle. 1907. Add. knowl. N. Z. Holoth. Journ. Linn. Soc. Zool. XXX. p. 101. Pl. 13.18.a–d.
— — Benham. 1909. Echinoderma. Sci. Res. N. Z. G. Trawling Exped. Rec. Canterbury Mus. I 2. p. 28.

Akaroa Harbour, 3 fms; mud. 15/XII. 1914. 1 specimen.

I have nothing to add to the careful descriptions given by Dendy, Perrier and Dendy & Hindle, would only emphasize my perfect agreement with Dendy & Hindle in regarding Perrier's *Phyllophorus anatinus* as a synonym only of *Ph. longidentis.*

Among some various material from Akaroa Harbour, received from Mr. Suter in 1899, is also a very young specimen of this species, ca. 10 mm long. It is strongly curved and has very much the shape of an *Echinocucumis,* the more so as the tubefeet are very indistinct (perhaps on account of the rather poor preservation). There is, however, no doubt that it belongs to *Ph. longidentis.* It is noteworthy that its spicules are almost exclusively of the beautiful cruciform type figured by Dendy (1896; Pl. 6, figs. 64 and 67), while those of the larger specimen taken by the author in 1914, are much more irregular in shape, hardly a single regularly cruciform spicule being met with. (This specimen was found adhering to the anchor of the ship. There was, unfortunately, no opportunity of making any dredgings here).

14. *Phyllophorus dearmatus* Dendy & Hindle.

Phyllophorus dearmatus. Dendy & Hindle. 1907. Additions to our knowledge of New Zealand Holothurians. Journ. Linn. Soc. Zool. XXX. p. 103. Pl. 11.7-8; Pl. 12,15; Pl. 13,20.
— — E. C. Joshua. 1914. Victorian Holothurioidea Proc. R. Soc. Victoria. 27. p. 4.

Wellington Harbour, 5—10 fms; hard bottom. 16/II. 1915. 2 specimens.

In spite of some rather important differences from the description given by Dendy & Hindle the two specimens in hand must evidently be referred to this species, which was known hitherto only in the single specimen obtained by Mr. Suter in Akaroa Harbour.

Fig. 36. Pharynx and calcareous ring of *Phyllophorus dearmatus*. Two of the retractor muscles are indicated. the one in front is wholly removed. Posteriorly the pharynx is seen continuing into the (forwards directed) oesophagus, which is surrounded at its base by the watervascular ring, from which proceed the long, straight stone canal and the long, slender Polian vesicle. 6/1.

The most conspicuous difference is found in the shape of the calcareous ring. As a comparison of the figure given here with that of Dendy & Hindle (Pl. 11, fig. 8) will show, the interradials differ very markedly from those in Dendy & Hindle's figure. I cannot give any explanation of the difference but must simply state that in both my specimens the calcareous ring has the shape shown in fig. 36.

The tentacles of the type specimen were twenty; one of my specimens has only 18 tentacles, only 4 pairs of the large tentacles being developed. This is probably simply an individual abnormality. They are more or less unequally developed in all pairs; the ventral pair is considerably smaller than the others.

While the skin of the body is totally devoid of spicules, as was also the type-specimen, I find spicules well developed in the anal extremity of the present specimens. They are tables, with a spire of two columns, ending in some 8—12 tho ns. The disk has generally 8 holes, 4 inner, somewhat larger and 4 outer, smaller ones, alternating with the former. The edge of the disk is perfectly smooth (fig. 37.a). No distinct anal teeth. The tentacles contain rather numerous spicules, thin rods with a hole or two in each end (Fig. 37.b). The tubefeet are devoid of

spicules, except those of the posterior extremity, in which the tables continue unto the end-plate.

The body is more regularly fusiform than in the type speci-

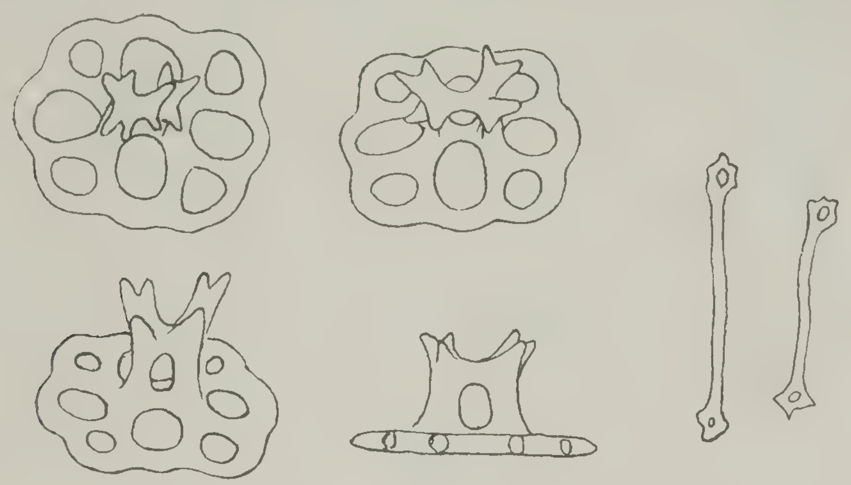


Fig. 37. Calcareous deposits of *Phyllophorus dearmatus*. a. Tables, from above and in side view; b. rods from the tentacles. 275/1.

men; one of my specimens has a distinct, but short caudal appendage. This, however, is certainly due to contraction on preservation.

It appears (Joshua, Op. cit.) that this species is widely distributed also along the southern coasts of Australia.

15. *Pseudocucumis Thomsoni* (Hutton).

Cucumaria thomsoni. Hutton. 1878. Notes on some New Zealand Echinodermata. Trans. N. Z. Inst. XI. p. 307.

— (?) — Dendy. 1896. Observ. Holoth. N. Z. Journ. Linn. Soc. Zool. 26. p. 34.

— — Farquhar. 1898. Echinod. Fauna N. Z. Proc. Linn. Soc. N. S. W. p. 324.

Stewart Island, 20 fms; hard bottom. 16/XI. 1914. 3 specimens.

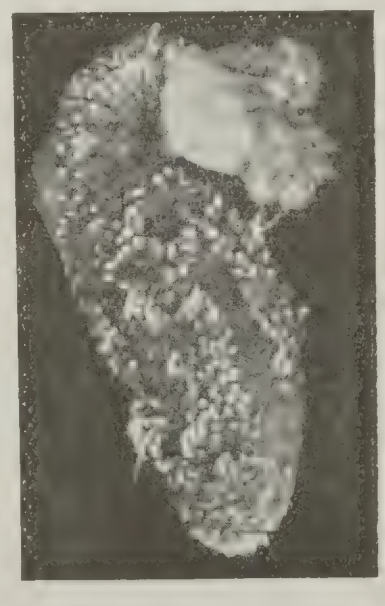


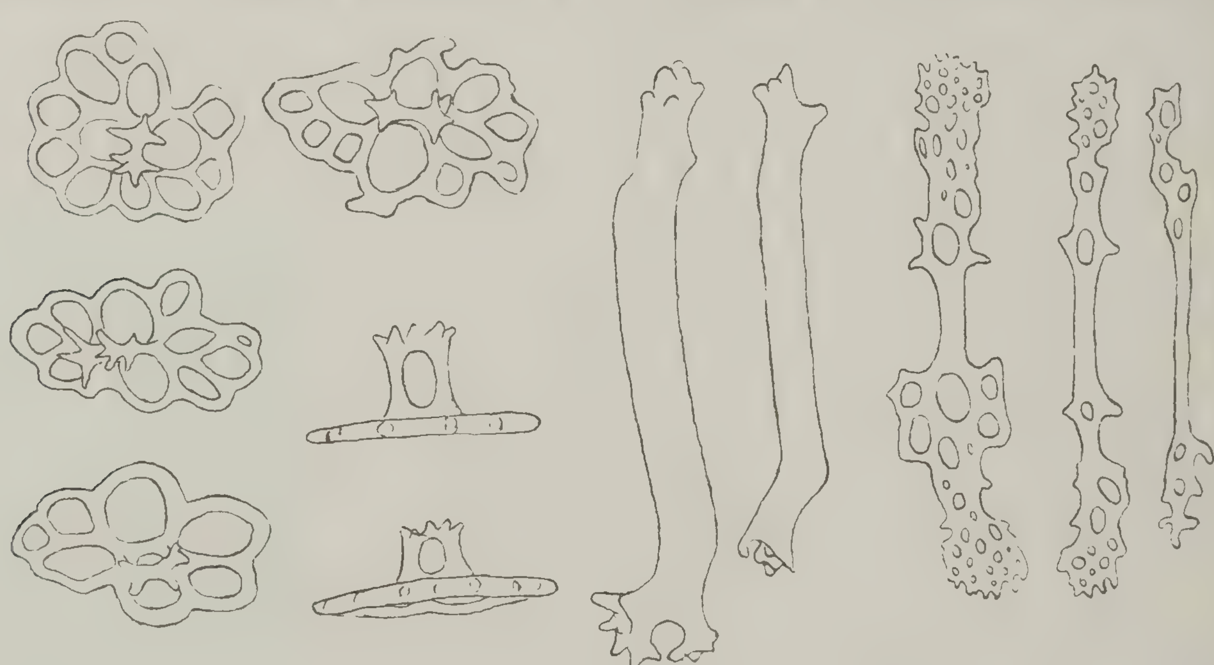
Fig. 38. *Pseudocucumis Thomsoni*. Nat. size.

There can be no question but that these specimens really belong to Hutton's *Cucumaria thomsoni.* They agree perfectly with the original description; moreover, I have had for comparison, through the kindness of Dr. C. C. Monro, a piece of skin of the type specimen, which is preserved in the British Museum, and find it to agree with my specimens in the characteristic feature: the strong wrinkling of

Fig. 39. Calcareous ring and Polian vesicles of *Pseudocucumis Thomsoni*. Two of the retractor muscles drawn, the one in the middle removed. $^4/_1$.

the epidermis, one of the few characters emphasized in the short description given by Hutton. — It will be necessary to give a complete description of the species.

Two of the specimens are about 5 cm long, fairly well extended (Fig. 38); the third is only 9 mm long, much contracted. The two larger specimens are brownish, the tubefeet whitish; the anterior end (the introvert) and the tentacles white. The general shape is, as stated by Hutton, fusiform. The tubefeet are disposed in close series along each radius, not spreading over the interradii. The tentacles are in one of the specimens well extended; they are 25, disposed in two circles, an outer circle of 15 larger, much branched, an inner circle of 10 smaller ones. The dorsal pair of tentacles in the outer circle conspicuously smaller than the others; between their bases the genital duct opens on a rather large papilla. In the other larger specimen, with the tentacles retracted, I cannot find more than 18 of them. In the younger specimen only 15 tentacles are found, evidently all belonging to the outer circle, the



a. b. c.

Fig. 40. Calcareous deposits of *Pseudocucumis Thomsoni*. a. Tables, from above and in side view; b. rods from the tentacles; c. spicules from mouth-papillæ. $^{275}/_1$.

tentacles of the inner circle having thus not yet appeared. — The entrance to the mouth is finely papillate, whereas no circle of papillæ surrounding the circles of tentacles is found, such as is the case in *Ps. bicolumnatus* Dendy & Hindle, the other New Zealand species of the genus *Pseudocucumis*.

The calcareous ring is simple, the interradial pieces small and slender (Fig. 39). The powerful retractor muscles are attached about in the middle of the body. There are two large Polian vesicles (Fig. 39), joining at the base, and one short stone-canal with a complicate, folded, madreporic head. Genital coeca numerous, fine, intermingling, but hardly branching. The respiratory trees well branched. The oesophagus is somewhat widened in its lower part, where it passes into the intestine; it is distinctly papillate here (on its outer surface), the papillæ not passing on to the intestine.

Calcareous deposits exceedingly scarce, only very rarely a rudimentary one may be found in the skin; in the anterior, introverted part they are slightly more common and better developed. They are tables (Fig. 40.a), with a somewhat irregular disk and a small spire of two columns. The tubefeet have a well developed terminal disk-plate, but otherwise no spicules at all. In the tentacles are found fairly numerous fine rods (Fig. 40.b) in the branches, but none in the stem. The papillæ of the mouth contain finely branched, elongate spicules (Fig. 40.c).

From *Pseudocucumis bicolumnatus* this species is very well distinguished through several characters: The calcareous deposits are very numerous in *bicolumnatus* and also different in structure (with a round disk); the shape of the calcareous ring is different in the two species (cf. Pl. 11. 6.a of Dendy & Hindle's paper), and there is only one Polian vesicle in *bicolumnatus*.

16. *Pseudopsolus macquariensis* (Dendy).

Psolus macquariensis.	Dendy. 1896. Observations on the Holothurians of New Zealand. Journ. Linn. Soc. Zool. XXVI. p. 41. Pl. 7_{70-72}.
— —	Farquhar. 1898. Echinod. Fauna of New Zealand. Proc. Linn. Soc. N. S. W. p. 325.
Pseudopsolus —	Ludwig. 1898. Holoth. Hamburg. Magalh. Sammelreise; p. 49.

Pseudopsolus macquariensis. R. Perrier. 1904. Holoth. Antarct. Mus. d'hist. nat. Paris. Ann. Sc. nat. Zool. 9. Sér. I. p. 111.

Stewart Island. 2 specimens, collected by Professor Benham.

To the very careful description given by Dendy and Ludwig I have but very little to add.

As stated above (p. 335) under *Cucumaria brevidentis,* var. *carnleyensis,* there is some reason for believing that the labelling of these specimens is unreliable, and that they really came from Macquarie Island. Otherwise, the occurrence at Stewart Island of this species would not be very surprising, as it might easily be transported on large algæ, being a littoral form.

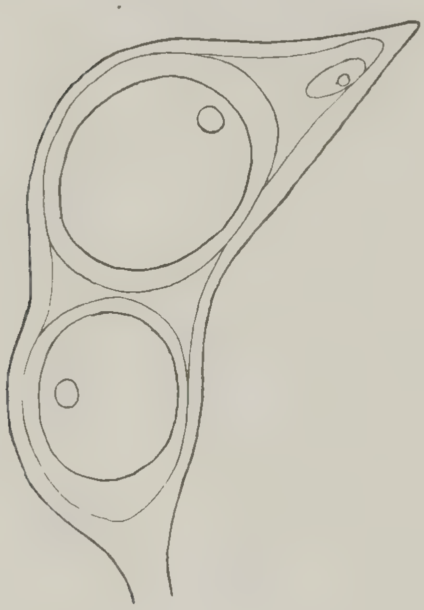


Fig. 41. Genital coecum of *Pseudopsolus macquariensis.* 15/1.

Calcareous deposits, like those figured by Dendy, are found in the latero-dorsal interradii, though rather sparingly, in one specimen; in the other I did not find any. Tentacles and tubefeet entirely devoid of spicules as stated by Ludwig.

The interesting fact that this species is hermaphroditic was discovered by Ludwig, who also pointed out that the hermaphroditism is successive. My specimens afford some interesting information about this point. The younger of the specimens, 13 mm long (tentacles extended) has some few (7) female genital coeca, 3—4 mm long, each containing two very large, somewhat oval eggs, about 1.5 mm in diameter, and one or two young eggs in the pointed end of the tube (Fig. 41). Besides, there are about the same number of quite small genital coeca, each with two young eggs, and further two young male genital coeca. In the second specimen, 19 mm long (also fairly well extended), there is a number of long male genital coeca, filling out the body cavity, and a number of very short, female genital coeca with quite small eggs — as found by Ludwig. This proves that the species at first produces eggs, then sperma, and then, evidently, again eggs.

Psolidiella n. g.

Body *Psolus*-like, with a distinct ventral sole, which is, however, not limited from the rest of the body through a sharp edge. Outside the sole the body all over provided with tubefeet which do not show any serial arrangement. Calcareous deposits not in the shape of distinct, overlapping scales. The posterior part of the intestine, with its mesentery, in the left ventral interradius.

Genotype: *Psolidiella nigra* n. sp.

Though superficially resembling a Psolid this form does not really belong to the *Psolus*-group, as is shown beyond any doubt through the fact that the posterior part of the intestine is in the left ventral interradius. As has been pointed out by Hj. Østergren the situation of the posterier part of the intestine appears to be of primary importance for the subdivision of Dendrochirotes, the Cucumariids and the Phyllophorids having it in the left, the Psolids having it in the right ventral interradius.

The species here made the type of the new genus *Psolidiella* I was at first inclined to refer to the genus *Psolidium*, until the discovery of the situation of the hind part of its intestine in the left ventral interradius revealed the fact that it is a Cucumariid, not a Psolid. The species hitherto referred to *Psolidium* show very great diversity in shape; some of them resemble true *Psolus* in shape and scaling, others are more *Cucumaria*-like in shape and devoid of a true scale-covering; the suggestion therefore lies at hand that all these various forms do not really belong to one and the same genus. The type of the genus *Psolidium*, *Ps. dorsipes* Ludwig, (— I have been able to examine a specimen[1]) belonging to the Paris Museum, and beg herewith to offer my best thanks to Professor L. Joubin for his kindness in lending me the specimen for examination —) agrees with true Psolids in regard to the situation of the intestine. It is to be expected that the other species

[1]) The specimen unfortunately had been opened just in the critical point, the posterior end of the right ventral interradius, and part of the intestine removed. Enough, however, remained to show beyond doubt that the posterior part of the intestine really lies in the right ventral interradius, not in the left.

of *Psolidium* resembling it in shape and scaling will prove to agree with *Ps. dorsipes* also in the character of the intestine. These then must remain in the genus *Psolidium*. The more *Cucumaria*-like forms will probably be found to agree with *Psolidiella* in the character of the intestine, and it may well be suggested that they may be referred to this latter genus. Not having material for examining the question in detail I must content myself with these suggestions, leaving it to others, who are more fortunate in having access to material of these forms, to give the proof of my suggestion.

It is, of course, possible that some of the characters mentioned in the description of the species ought really to be included in the diagnosis of the genus; this cannot be decided, until more species have been shown definitely to belong to this genus.

17. *Psolidiella nigra* n. sp.

Paterson Inlet, Stewart Island; on rocky shore. 6/IV. 1924, (Sten Vallin). 3 specimens.

Largest specimen 23 mm long (tentacles retracted). Shape of body *Psolus*-like, with a well marked off ventral sole and a short caudal prolongation (Fig. 42). Tubefeet arranged in about four, somewhat irregular, crowded series in the radii of the ventral sole; in the middle part of the median radius they stand less closely and only in two series. At the anterior end of the sole the ventrolateral series of tubefeet turn inwards so as to join those of the midventral series, thus forming a definite anterior border of the ventral sole. At the posterior end of the sole they are similarly arranged, but here a small naked space is left between the median and the lateral series. Through this arrangement of the tubefeet the ventral sole becomes very distinctly limited; the limitation is further emphasized through the colour, the ventral sole with its tubefeet being white, while the body otherwise is black. In the body wall itself there is no sharp limit between the ventral sole and the sides of the body. The tubefeet of the three ventral radii do not con-

a. b.

Fig. 42. *Psolidiella nigra*. a. From above, b. from below. Nat. size.

tinue anteriorly or posteriorly beyond the sole. Outside the sole the whole body is closely covered with small whitish tubefeet, which give the otherwise black body a finely spotted appearance. Even at the anterior and posterior end no serial arrangement of these tubefeet is discernible. No anal teeth.

Tentacles 10, black, subequal. Calcareous ring simple, well developed (Fig. 43.d.) Retractor muscles short, attached in the

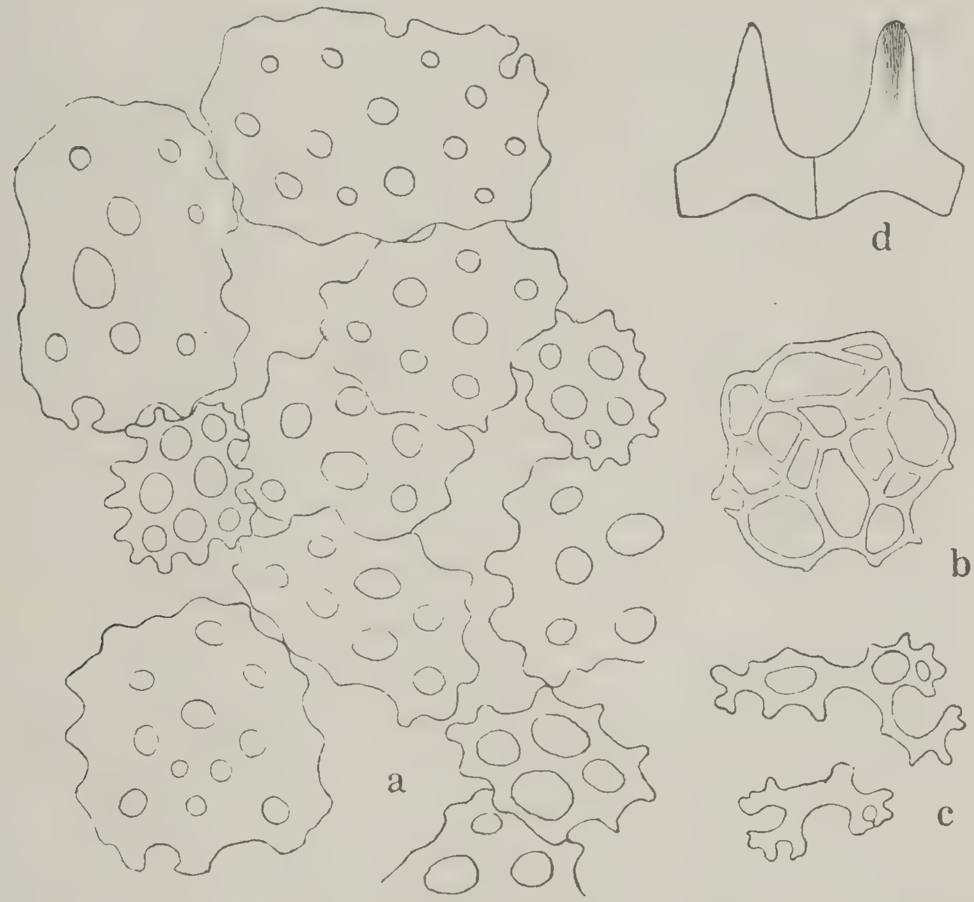


Fig. 43. Calcareous deposits and calcareous ring (d) of *Psolidiella nigra*. a. Deposits from the ventral sole, natural group; b. disk from dorsal tubefoot: c. spicules from tubefoot; d. radial and interradial of calcareous ring. a—c. 150/1; d. 9/1.

anterior part of the body. One Polian vesicle and one very short stone canal. Oesophagus without muscular thickening. Genital coeca numerous, very long, unbranched, filling up the body cavity. Respiratory trees well developed.

Calcareous deposits small, somewhat irregular, smooth plates, which lie in a close layer in the ventral sole, but hardly overlapping (Fig. 43.a.). Among these are found some finer, more regular, button-like plates, together with various developmental stages of the former sort. In the dorsal skin only the first sort of calcareous bodies occur, much more sparingly and accordingly not at all overlapping; they are slightly smaller than those of the ventral sole.

Ventral tubefeet with a large, regular end-plate, the dorsal tubefeet with a small, irregular one (Fig. 43.b); both sorts of tubefeet with a few, irregular spicules (Fig. 43.c) near the disk; similar spicules are found in the tentacles.

The black colour must make this species very difficult to observe on the dark rocks, where it lives, and thus afford it a most effective protection.

The nearest relative of this, both in regard to morphology and biology, highly interesting Holothurian would seem to be *Psolidium gaini* Vaney (Holothuries. II. Expéd. Antarct. Francaise. 1914. p. 18. Pl. I.7—9, IV.6—14), which may well be suggested to belong in reality to *Psolidiella*, not to *Psolidium* s. str.

The discovery of this species is due to the young Swedish zoologist, Dr. Sten Vallin, who paid a short visit to the Stewart Island in 1924, on a whaling trip to the Antarctic seas.

18. *Psolus neozelanicus* n. sp.

2 miles E. of North Cape, N. Z ; 55 fms; hard bottom. 2/I. 1915. 2 specimens.

The larger specimen is 10 mm long, with tentacles expanded; it has a short caudal appendage. The body of this specimen is rather high, but the somewhat inrolled edges of the sole show that this is not the normal shape. The second specimen, 7 mm long, with retracted tentacles, is very flattened (Fig. 44); no doubt this specimen shows the natural shape of the body. Colour white.

The scales of the dorsal side are fairly large, imbricating at least on the sides of the body; 4—5 scales between the introvert and the caudal appendage. The scales are set, not very closely, with small, sharp grains. The overlapping edge of the scales whitish. The introvert is surrounded by 5 large, interradial valves. Smaller scales are found at the base, the limit between the oral valves and the scales of the body being not very distinct. 3—4 circles of smaller scales round the anal opening.

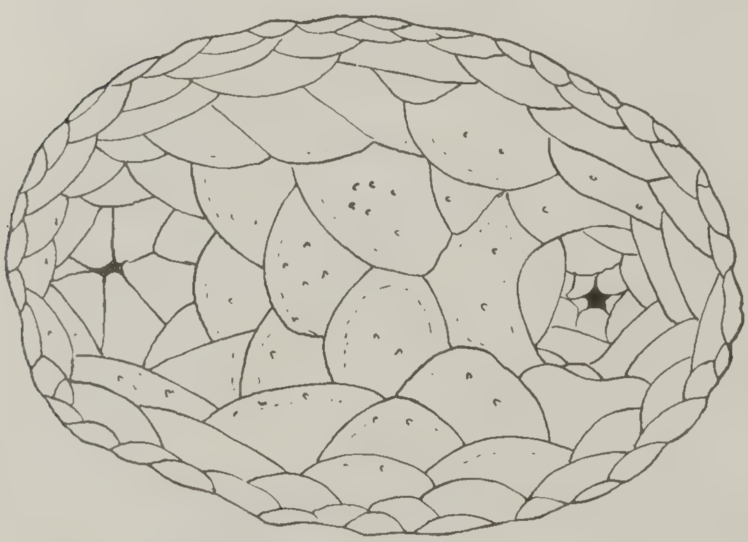


Fig. 44. *Psolus neozelanicus.* Dorsal side. 8/1.

The ventral sole with a close layer of fairly regular plates, in which, as a rule, four primary holes are recognizable, surrounded by an outer, more or less regular circle of smaller holes; rounded projections along the edge, and mostly a few knobs in the middle of the plate. (Fig. 45).

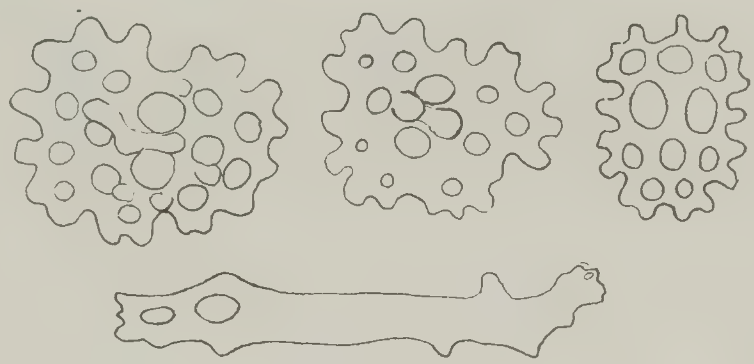


Fig. 45. Calcareous deposits of *Psolus neozelanicus*. The upper series plates from the ventral sole; lower figure rod from tentacle. $^{165}/_{1}$.

Tentacles 10, finely branched; the ventral pair conspicuosly smaller than the others, not branched, only bifid at the point. Tubefeet of the ventral sole arranged in a double series around the whole edge of the sole, those of the outer series being as large as those of the inner series. No tubefeet in the median radius. Spicules of tubefeet like the plates of the ventral sole, only bent so as to fit the wall of the feet; those of the tentacles irregular, more or less branched rods (Fig. 45, the lower figure).

Calcareous ring well developed, of the form usual in this genus. 1 stone canal and 1 Polian vesicle. 5 pairs of short, thick genital coeca, containing a fairly large number of rather small eggs, ca. $0._2$ mm in diameter (which have the appearance of being, at least, very nearly ripe). This small size of the eggs, rather unusual for a Dendrochirote, would seem to indicate that this species may perhaps have true pelagic larvæ, though such are otherwise unknown among the Dendrochirotes. At least, we may feel sure that it does not protect its brood.

It appears that this species is not very closely related to any other species hitherto described; but it is evident that it belongs to the *squamatus*-group.

19. *Caudina coriacea* (Hutton).

Molpadia coriacea. Hutton. 1872. Catalogue Echinod. New Zealand; p. 17.

— — Hutton. 1878. Notes on New Zealand Echinod. Trans. N. Z. Inst. XI. p. 307.

Caudina meridionalis. F. Jeffr. Bell. 1883. Studies in Holoth II. P. Z. S. p. 58. Pl. XV.$_1$.

Caudina coriacea. Théel. 1886. "Challenger" Holoth. II. p. 47, 54. Pl. III.4.
— — Dendy. 1897. Observ. Holoth. N. Z. Journ. Linn. Soc. Zool. XXVI. p. 28. Pl. 3.9—18.
— — Dendy. 1897. On some points in the anatomy of Caudina coriacea. Ibidem. p. 456. Pl. 29
— — Farquhar. 1898. Echinod. Fauna N. Z. Proc. Linn. Soc. N. S. Wales. p. 324.
— — Ludwig. 1898. Holoth. Hamburg. Magalh. Sammelreise; p. 63.
— *pulchella.* R. Perrier. 1905. Holoth. Antarct. Mus. Paris. Ann. Sci. Nat. Zool. 9. Sér. I. p. 117, Pl. V.14—17.
— *coriacea*, var. *brevicauda.* Perrier. 1905. Ibidem, p. 121.
— — Dendy & Hindle. 1907. Add. Knowl. N. Z. Holoth. J. Linn. Soc. Zool. XXX. p. 108.
— *chilensis* (Müller). H. L. Clark. 1907. The Apodous Holothurians; p. 175.
— — Benham. 1909. Echinoderma. Sci. Rec. N. Z. G. Trawling Exped. Rec. Canterbury Mus. I.2. p. 28.
Non: *Molpadia chilensis.* Johs. Müller. 1850. Anat. Studien über Echinodermen. Müll. Arch. p. 139. 1854. Über den Bau d. Echinodermen. Tal. IX. 1,12.
— — *australis.* Semper. 1868. Holothurien; p. 233. Taf. 39.14.
— *Caudina chilensis.* Joshua & Creed, 1915. South Australian Holothurioidea. Trans. & Proc. R. Soc. S. Australia. XXXIX. p. 21. (= *C. australis* (Semper)).
— — — Joshua. 1914. Victorian Holothurioidea. Proc. R. Soc. Victoria. XXVII. p. 6.

Colville Channel, 35 fms; sandy mud. 21/XII 1914. 1 specimen (caudal appendage only).
Tiri-Tiri, 15 fms; mud. 28/XII 1914. 2 specimens (caudal appendages only).

These new localities are of interest, the species having not hitherto been recorded from North of Cooks Strait.

H. L. Clark (Op. cit.) has declared both the New Zealand and the Australian form of *Caudina*, *C. coriacea* (Hutton) and *C. australis* (Semper) to be identical with the South American form, *C. chilensis* (Joh. Müller) and has been followed herein by Benham, Joshua & Creed. As I have had the opportunity of directly comparing specimens of both the New Zealand and the Australian form with the type-specimens of Joh. Müller, I am in a position to express a definite opinion about this matter. The result of the comparative

study of these forms is that they are beyond doubt separate species all of them, good distinguishing characters being afforded by the calcareous bodies of the skin as well as by the calcareous ring.

Figs. 46.a—c. represent the calcareous bodies of the three forms. *C. australis* is seen to differ from the two others in entirely lacking

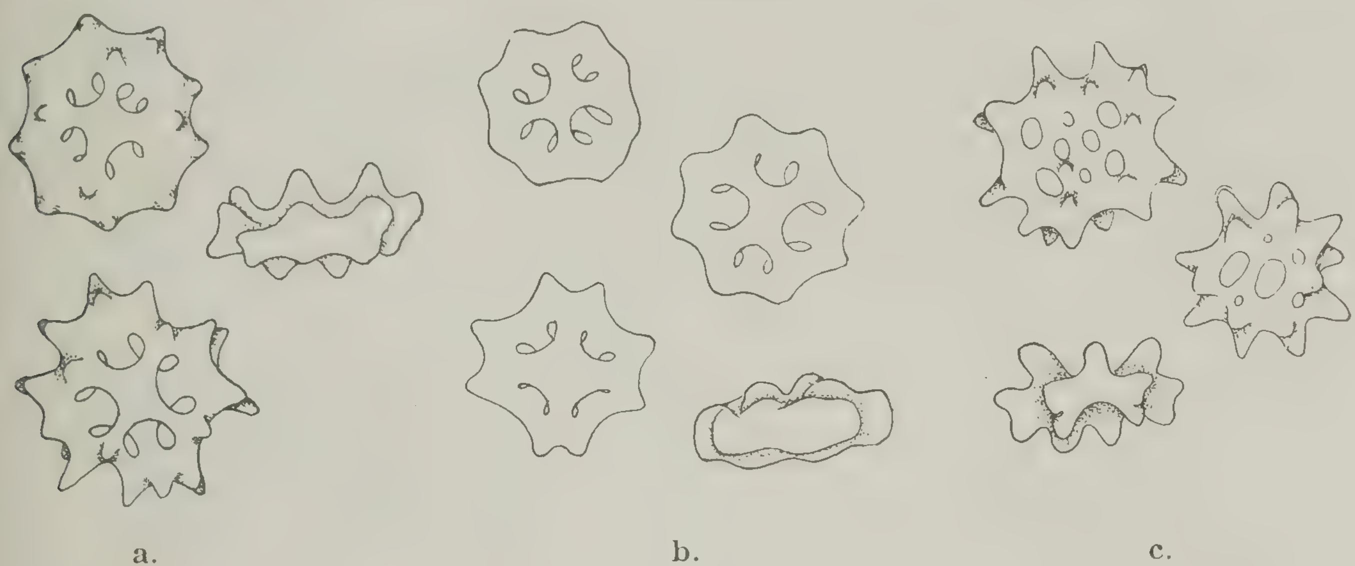


Fig. 46. Calcareous bodies, in front and side view, of *Caudina chilensis* (a), *C. coriacea* (b), and *C. australis* (c). $^{187}/_{1}$.

the characteristic x-formed elevation in the middle of the plates; there are several irregular holes and both sides are rather spiny. *C. coriacea* is more like *chilensis* in regard to these calcareous plates, but they are decidedly more thorny in *chilensis* than in *coriacea*. No less marked differences are found in the calcareous ring (Figs. 47.a—c). *C. chilensis* has long and narrow interradials with a distinct median keel, and the radials have three prominences on the anterior margin, one median and two lateral ones.[1]) *C. coriacea* has short broad interradials, without a longitudinal keel; the radials have only two lateral prominences on the anterior margin, being concave in the middle; they are also characteristic through being distinctly narrowed off the posterior end of the interradials, while in the two other species there is no such distinct narrowing. In *C. australis* the interradials are intermediate in form between those of *chilensis* and *coriacea*, while the radials are

[1]) This also holds good of *C. rugosa* Perrier, be this Chilenian form identical with *C. chilensis* or a separate species, a question which need not concern us here, seeing that it is, at any rate, different from the New Zealand species.

peculiar in being unsymmetrical, having at the anterior margin one simple and one double prominence; no median prominence. These differences, to which must furthermore be added the existence in *chilensis* of those remarkable organs regarded by Joh. Müller as Cuvierian organs which are absent in the two other forms (so far as I have been able to see on the not very satisfactory material at my disposal), make it evident that it is perfectly unjustifiable to unite all these forms into one single species. Very probably also other differences will be found between the three species, when well preserved specimens are available; but the facts pointed out here are already sufficient to show how illfounded it was to make *coriacea* and *australis* synonyms only of *chilensis*. The same most probably applies to the species *caudata* (Sluiter) form the Java Sea and *Ransonnettii* v. Marenzeller from the Chinese Sea, which Clark makes likewise synonyms of *chilensis*. I have had no opportunity of examining specimens of these two forms, but the figures of the calcareous ring and the calcareous bodies given in the original descriptions seem to me to leave no doubt but that they are perfectly distinct species, as might also be expected from zoogeographical reasons. Thus the zoogeographical paradox of the species *Caudina chilensis* occurring at S. America, New Zealand, Australia, the Java Sea and China need not trouble us any more and worrying over the name *chilensis* as inappropriate for the New Zealand —Australian—Javanese—Chinese species is likewise quite superfluous. But we may well worry over the harm that this mixing up of all these various forms has already done.

a. b. c.

Fig. 47. Radial and interradial of calcareous ring of *Caudina australis* (a), *C. coriacea* (b), and *C. chilensis* (c). 4/1.

I beg to express my sincere thanks to Dr. W. Arndt, Zoological Museum, Berlin, for lending the type specimens of Joh. Müller's *Molpadia chilensis*, and to Dr. Edgar R. Waite, Di-

rector of the S. Australian Museum, Adelaide, for sending me a pair specimens of Joshua & Creed's "*Caudina chilensis*", which proved to belong to *Caudina australis* (Semper).

20. *Protankyra uncinata* (Hutton).

Synapta uncinata. Hutton. 1872. Catalogue Echinod. New Zealand; p. 16.
— *inæqualis.* Hutton. 1872. Ibidem, p. 17.
— *uncinata.* Théel. 1886. "Challenger" Holoth. II. p. 27.
— — Dendy. 1897. Observ. Holoth. N. Z. Journ. Linn. Soc. Zool. XXVI, p. 25.
— — Farquhar. 1898. Echinod. Fauna N. Z. Proc. Linn. Soc. N. S. W. p. 323.

Wellington Harbour, ca. 5 fms; mud. 16/II. 1915. 1 specimen.
Colville Channel, 35 fms; sandy mud. 21/XII. 1914. 1 specimen.
Tiri-Tiri, Auckland, 15 fms; mud. 5 specimens and some fragments.

Of this species was hitherto known only the single specimen, the type, upon which the description of Hutton as also the additional description given by Dendy was based. It is then a matter of satisfaction that material has been collected which enables me to supply information on some points which Dendy had to leave unsettled because of the unsatisfactory state of preservation of the type specimen.

The largest of the specimens in hand measures 8.5 cm in length, by 5—6 mm in diameter; the anterior half is, however, rather strongly contracted, so that the specimen may well have been some 12 cm long when fully extended, which corresponds fairly well to the size of the type specimen, as estimated by Dendy.

Fig. 48. Two tentacles of *Protankyra uncinata*, showing sensory cups. 15/1.

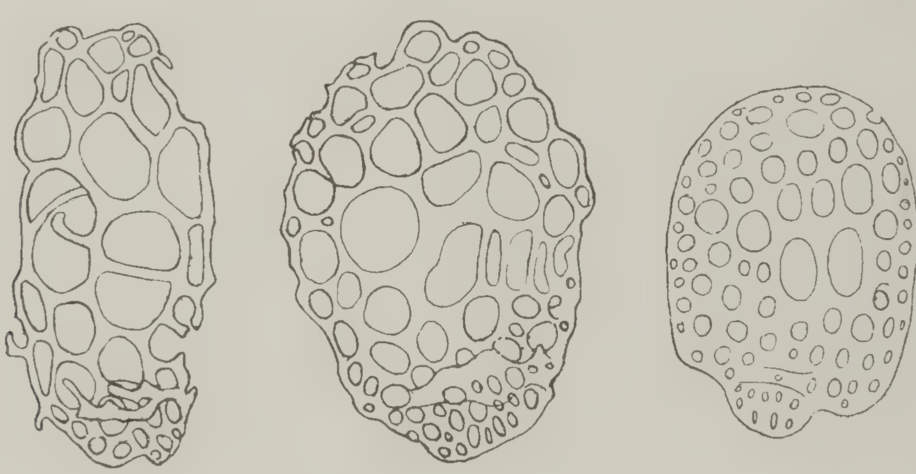
All the specimens in hand have 12 tentacles; thus, the type specimen evidently is exceptional in having 13 tentacles. Generally, but not always, the dorsal tentacles are distinctly longer than the ventral ones. There are two pairs

of slender digits, about equal in length; the terminal digit is quite short, knobshaped. Sensory cups arranged in two lateral series,

a. b. c. d.

Fig. 49. Anchors of *Protankyra uncinata*. a. Symmetrical form; b—c. unsymmetrical forms; d. unsymmetrical form of "*Synapta inæqualis*". $^{120}/_{1}$.

very prominent, recalling, indeed, as stated by Dendy, sucker-bearing tubefeet. (Fig. 48). A brownish-yellow spot at the base between each pair of tentacles. The anchors (Fig. 49.a—d) measure



a. b. c.

Fig. 50. Anchorplates of *Protankyra uncinata*. a. From the posterior part of body; b. from anterior part; c. exceptionally complete anchor plate. $^{120}/_{1}$.

ca. $0._3$—$0._4$ mm. They are symmetrical, the arms more or less serrate or smooth, and the stock finely toothed, unbranched. The plates are irregular, with smooth holes, and with an imperfect bow, or none, across the posterior end. They are very conspicuously

different in the posterior and anterior part of the body. In the posterior part they are small and narrow, irregular in shape, in the anterior part large and rounded (Figs. 50.a—c). This difference is so conspicuous that, if the two forms were not found in one and the same specimen, one would rather think them to belong to two different species. — In the anterior end some small, irregular, fenestrated plates (Fig. 51.a) occur, more or less sparsely. Numerous small lenticular bodies (Fig. 51.b) occur in the longitudinal muscle bands. In the tentacles numerous curved rods, slightly widened in the ends are found. (Fig. 51.c).

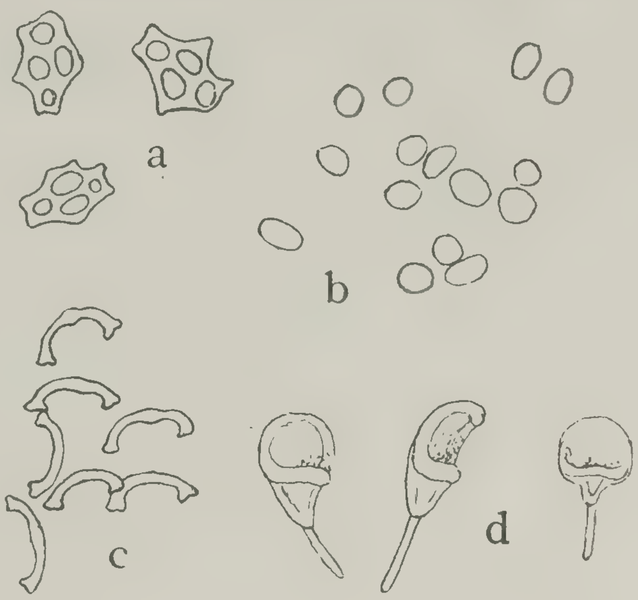


Fig. 51. Calcareous deposits (a—c) and ciliated funnels (d) of *Protankyra uncinata*. a. Small plates from anterior part of body; b. lenticular bodies from longitudinal muscles; c. rods from tentacles. a—c. 145/1; d. 80/1.

Regarding the inner anatomy I may add the following observations to those given by Dendy. Calcareous ring consisting of 12 pieces of a square shape (Fig. 52); each of the dorsolateral interradii with two interradial pieces; the radial pieces perforated. Oesophagus long and thin; no distinct stomach, a small swelling on the oesophagus in the specimens opened being due, evidently, to swallowed food particles. The loop of the intestine rather short. — Genital organs slightly branched; the genital duct opens in the middorsal line, just behind the tentacles. I have found only one, much convoluted stone canal. Polian vesicles 4—5 (in the type specimen Dendy found nine of them). Ciliated funnels very numerous, occurring in the middorsal and left dorsal interradii in the whole length of the body; they are very small, rather longstalked, slipper-shaped (Fig. 51.d), placed somewhat scattered.

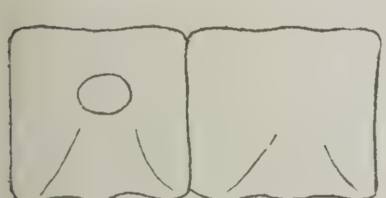


Fig. 52. Radial and interradial of calcareous ring of *Protankyra uncinata*. 20/1.

The anterior end of the body with numerous reddish spots, especially on the dorsal side.

The small size of the eggs, ca. 0.1 mm, indicates that this species may probably have a typical Auricularia larva.

The locality of the type-specimen is unknown. From the localities given here it may well be

concluded that the species will be found distributed at least along the East Coast of the North Island, from Cook Strait to the Hauraki Gulf.

Not rarely asymmetrical anchors are found among the normal symmetrical ones; in one specimen (from Tiri-Tiri) even the majority of the anchors are asymmetrical, with smooth arms (Fig. 49.b—c), and finally in a specimen from off Kapiti Isl., Cook Strait, 12 fms (collected by Dr. G. M. Thomson in 1915) which was sent me by Professor Benham, all the anchors are asymmetrical, with smooth arms (Fig. 40.d). That we have here a specimen of Hutton's *Synapta inæqualis* seems beyond doubt. But as this specimen in all other features perfectly agrees with the typical *Protankyra uncinata,* this leads to the result that Hutton's *Synapta inæqualis* is the same species as his *Synapta uncinata.* As he had only a fragment of *"inæqualis"*, without the tentacles and the anterior end, it was only natural that he regarded it as a separate species, in view of the very curious character of the anchors. But the finding of specimens with unsymmetrical anchors in varying numbers among the symmetrical form of anchors, while all other characters remain the same as in those without asymmetrical anchors, leaves no doubt but that it is all individual variations of one and the same species.

21. *Chiridota gigas* Dendy & Hindle.

Chiridota gigas. Dendy & Hindle. 1907. Add. knowl. N. Z. Holoth. Journ. Linn. Soc. Zool. XXX. p. 110. Pl. 12_{9-11}.
— — Joshua. 1914. Victorian Holothurioidea. Proc. R. Soc. Victoria. XXVII. p. 7.

1 specimen from Dusky Sound; sent by Professor Benham.

The specimen measures ca. 11 cm in length, but is very much contracted in its anterior part and must therefore have been at least some 2—3 cm longer in a living state. In its posterior end, which is fully distended, it measures ca. 12 mm in diameter.

The characters of this specimen agree very completely with those given in the original description by Dendy & Hindle, to which I have only to add that the ciliated funnels appear to occur

only in the left dorsolateral interradius, scattered over the whole breadth of the interradius. They are of a broad trumpet-shape, with a short stalk (Fig. 53).

The specimen contains apparently ripe eggs, which are very small, ca. 0.08 mm in diameter. This would appear to indicate that this species has a typical Auricularia-larva.

Fig. 53. Ciliated funnels of *Chiridota gigas*. 70/1.

The species having hitherto been recorded only from the Chatham Islands and the Victorian Coast, it is very satisfactory now to have a definite record of its occurrence also at New Zealand, where it was, of course, to be expected to occur.

22. *Chiridota nigra* n. sp.

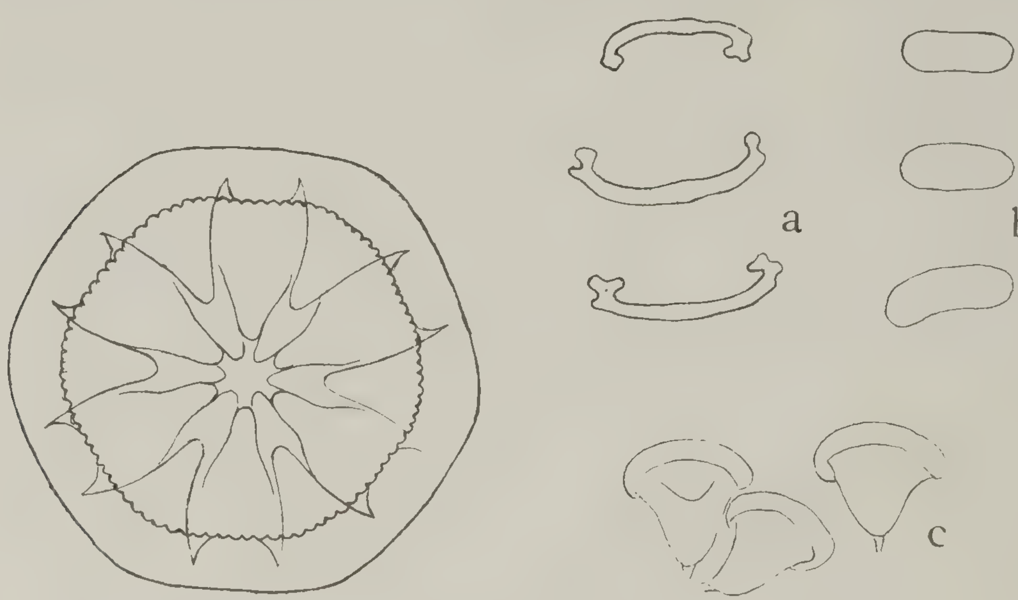
Chiridota gigas. Benham. 1909. Echinoderma. Sci. Res. N. Z. G Trawling Exped. Rec. Canterbury Mus. I.2 1909. p 3.
Non: *Chiridota gigas* Dendy & Hindle. 1907. Add. Knowl. N. Z. Holoth. J. Linn. Soc. Zool. XXX. p. 110. Pl. 12.9—11.

Paterson Inlet, Stewart Island, 12—15 fms; mud. 17/XI. 1914. 3 specimens.
Carnley Harbour, Auckland Isl., ca 45 fms. 6/XII. 1914. 1 specimen.

The specimen from Carnley Harbour is a fragment in poor condition, without the anterior end. One of the specimens from Paterson Inlet is a fragment of the anterior end of a young specimen, in very poor condition. The others are large ones, in fairly good condition, though broken to pieces, so that it is impossible to give the exact length of the specimens. One of the fragments measures 14 cm in length; as it is partly strongly contracted and lacks the anterior end, we may safely conclude that this specimen was at least, 20 cm long; in the non-contracted part it measures ca. 1.5 cm in diameter. It is thus clear that this species reaches a large size, probably equalling that of *Chiridota gigas* which, according to Joshua[1]) is capable of extending itself to a length of about two feet.

1) E. C. Joshua. Victorian Holothurioidea, with descriptions of new species. Trans. R. Soc. Victoria. 27. 1914. p. 7.

The colour is very dark violet or black, with more or less numerous very small lighter spots, and more or less distinct, close-set, fine longitudinal and transversal lines of a lighter colour, which may give the skin a somewhat wrinkled appearance. These lines appear to be more developed on the ventral side. The skin is very brittle, falling off in small rags, disclosing the underlying white



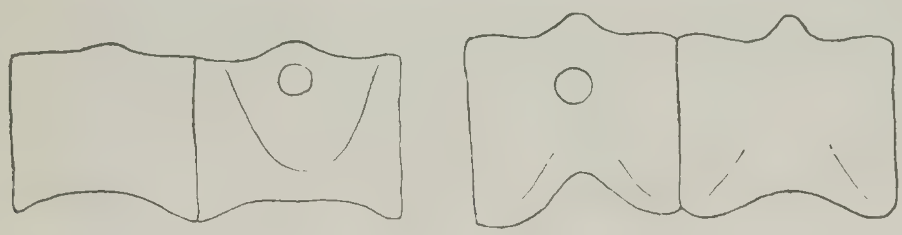
54. 55.

Fig. 54—55. *Chiridota nigra*. 54. Wheel. $^{230}/_{1}$. 55. a. rods from tentacles; b. lenticular bodies from longitudinal muscles; c. ciliated funnels. a—b. $^{275}/_{1}$; c. $^{80}/_{1}$.

muscle coat; this may give the specimens a very conspicuously mottled appearance, which is, however, unnatural, the living specimens being uniformly dark coloured, the small light spots mentioned above being hardly discernible without a lens. In the preserved specimens the wheel-papillæ form very conspicuous white spots, but this is due to the skin covering being lost. In a few cases, however, the skin covering of the papillæ is preserved, and also these show off as white spots; it may therefore well be concluded that in the living specimens the wheel-papillæ are visible as white spots. Otherwise the skin is smooth, without papillæ.

The wheel-papillæ appear to be confined to the dorsal side, forming an irregular longitudinal series in each of the three dorsal interradii. They are generally very large, compact, somewhat oval in shape, and contain a very large number of wheels, lying very compactly. In one such papilla I counted 165 wheels. The shape of the wheels (Fig. 54) is the usual, the size varying from 100 to 140 μ. Along the radial muscles numerous small elongate-oval,

smooth calcareous bodies (Fig. 55.b) occur, lying mainly parallel to the muscle fibres. No other calcareous bodies in the skin. The tentacles contain numerous small arched spicules, slightly widened



a. b.

Fig. 56. Radial and Interradial of *Chiridota nigra* (a) and *Ch. carnleyensis* (b). a. $^{15}/_{1}$, b. $^{18}/_{1}$.

in the ends (Fig. 55.a); they are arranged in a close series along each side of the tentacle and its digits.

The tentacles are twelwe in number, with 5—6 pairs of digits, the distal ones being the longer, though not very conspicuously longer than the proximal ones. The calcareous ring is composed of twelwe pieces, there being two interradial pieces in the two dorso-lateral interradii. The radial pieces are perforated (Fig. 56.a). Oesophagus rather long, without any muscular thickening. The intestine very sinuate, with a large loop. Its course otherwise not to be made out exactly. 8 Polian vesicles and one stone canal. The gonads long, unbranched tubes. The type specimen, the only one with the genital organs preserved, being a male, it is evident that the species has separate sexes. Ciliated funnels (Fig. 55.c), all small (0.1 mm), with a wide opening, in the left dorso-lateral and the left ventro-lateral interradii.

In his report on the Echinoderms of the N. Z. G. Trawling Expedition Benham records *Ch. gigas* Dendy & Hindle also from Stewart Island. Having received a pair of these specimens (collected by Dr. G. M. Thomson) from Prof. Benham I must declare them to be identical with *Ch. nigra,* not with *Ch. gigas.* Benham himself also appears to be in doubt about the correctness of identifying these specimens with *Ch. gigas.* — Judging

Fig. 57, Ciliated funnels of *Chiridota discolor.* $^{70}/_{1}$.

from the description of the colour also the other specimens (Molyneux Bay) referred by Benham to *Ch. gigas* would appear to be *Ch. nigra.*

The present species is very well distinguished from *Chiridota gigas* Dendy & Hindle through several characters, especially the totally different arrangement of the wheel-papillæ and the presence in the latter species of thick, curved rods with spinous ends. Also the colour is quite different, *Ch. gigas* being, according to Joshua, bright scarlet with white papillæ. From the two other large, dark species of the Pacific region, the Hawaiian *Ch. uniserialis* W. K. Fisher and the Japanese *Ch. regalis* H. L. Clark, it is easily distinguished through the absence of curved calcareous rods in the skin and in the wheel papillæ in these two species being confined to the mid-dorsal interradius. The Arctic Pacific species *Ch. discolor* Esch. might appear to have some relation to *Ch. nigra.* From the description of this species given by H. L. Clark (The Apodous Holothurians, 1907; p. 27) it is not easy to gather exactly by which characters it is distinguished from the New Zealand species, and a pair of poorly preserved fragments received from the U. S. National Museum do not allow a closer comparison of the two species. Only one important distinguishing character is disclosed, viz. the entirely different shape of the ciliated funnels, which are long and slender in *Ch. discolor* (Fig. 57), very short and broad in *Ch. nigra.* That the two species are perfectly distinct is beyond doubt.

23. *Chiridota carnleyensis* n. sp.

Carnley Harbour, Auckland Islands; ca. 45 fms. 6/XII. 1914. Several specimens.

The species was found to be very hard to preserve; most of the specimens were only fragments, without the anterior end. The larger of them measure 13—14 cm, by a diameter of ca. 6—8 mm. It is thus a rather large form, though not quite so large as *Ch. nigra* and *gigas.*

The colour is white-transparent, the radial muscles being distinctly seen through the skin, which is perfectly smooth. The wheels do not form papillæ; they are collected into diffuse round

heaps which may be so much as 2—3 mm in diameter, but which hardly form any prominence, except where the skin has been strongly contracted. They are of very irregular occurrence, sometimes lying quite close, sometimes very sparse; as a rule it appears that they are confined to the dorsal interradii, but sometimes they are found, though much more sparsely, also in the ventral interradii; they

Fig. 58. Ciliated funels of *Chiridota carnleyensis.* 65/1.

may form an irregular series in each interradius, but mostly they lie quite irregularly. Small patches may be found among the larger ones, and in these especially various stages of development of the wheels are met with. The wheels lying not nearly so compact as in *Ch. nigra*, the number of wheels in each heap is not so large as in that species, in spite of the larger size of the heap. I have counted ca. 125 wheels in one of the larger heaps. The structure of the wheel is exactly like that of *Ch. nigra,* so that I may simply refer to the figure of the latter; in regard to size they are more varying than in *Ch. nigra,* from 90—200 μ. Also the spicules of the tentacles are of the same shape as in that species. No calcareous spicules are found along the radii or in the skin.

The tentacles are twelwe in number, with 6—8 pairs of digits, gradually increasing in length towards the end of the tentacle, the distal ones being about twice the length of the proximal ones. An oval, reddish spot is found at the base, between each two tentacles; possibly it is a sense organ. The calcareous ring is composed of twelwe pieces, the two dorso-lateral interradii having each two interradial pieces. The radial pieces are perforate (Fig. 55.b).

There are 8—9 Polian vesicles and one stone-canal. The oesophagus is long, without any muscular thickening. The intestine makes the usual loop.

The genital organs are long, unbranched tubes. The sexes are separate; the eggs are rather small, ca. 0.2 mm.

Ciliated funnels in middorsal, left dorsal and right ventral interradii; they are slender, with a narrow opening. Those in the right ventral interradius are very large, very elegantly shaped, like a french-horn (Fig. 58). They may be up to 1 mm long, while the usual size otherwise is only ca. 0.2 mm. Also in the left dorsal interradius some larger funnels may be found among the usual small ones, but it appears that they do not grow nearly so large there as those in the right ventral interradius.

This species is rather sharply distinguished from all other species of *Chiridota* known till now, and it is hardly possible to point out any nearer relation of it.

24. *Trochodota dunedinensis* (Parker).

Chirodota dunedinensis. T. Jeffr. Parker. 1881. On a new Holothurian. Trans. N. Z. Inst. XIII. p. 418.

— — Hj. Théel. 1885. "Challenger" Holothurioidea. II. p. 34.

— — A. Dendy. 1897. Observations on the Holothurians of New Zealand. Journ. Linn. Soc. London. Zool. XXVI. p. 26. Pl. 3. figs. 1—8.

— — H. Farquhar. 1898. Echinoderm Fauna of New Zealand. Proc. Linn. Soc. N. S. Wales. p. 323.

Trochodota — H. Ludwig. 1898. Holothurien d. Hamburger magalhaensische Sammelreise; p. 87.

— — H. Lym. Clark. 1907. The Apodous Holothurians; p. 124.

— — R. Perrier. 1905. Holothuries antarctiques du Muséum d'hist. nat. Paris. Ann. Sci. nat. Zool. 9. Ser. I. p. 123.

Chiridota benhami. Dendy. 1909. On a small collection of Holothurians from the Auckland Islands. Subantarctic Isl. of New Zealand. I. p. 151. Pl. VI. figs. 3 a—l.

Trochodota dunedinensis. H. Lym. Clark. 1921. The Echinoderm Fauna of Torres Strait. Departm. Mar. Biol. Carnegie Inst. Washington, Vol. X. p. 166.

Trochodota benhami. H. Lym. Clark. Ibidem. p. 166.

? *Chiridota geminifera.* Dendy & Hindle. 1907. Additions to the knowledge of New Zealand Holothurians. Journ. Linn. Soc. Zool. XXX. p. 112. Pl. 14 80.

Non. *Trochodota dunedinensis.* M. J. Allan. 1911. Trochodota dunedinensis in Victoria. Trans. Amer. Microsc. Soc. III. 30. p. 325. (= *Trochodota allani* Joshua).

— — — H. Ohshima. 1914. The Synaptidae of Japan. Annot. Zool. Japan. VIII. p. 478. (*Tr. diasema* H. L. Clark).

— *Chiridota australiana* Stimps. Théel 1886. Challenger Holoth. II. p. 16.

Masked Island, Carnley Harbour, Auckland Isl. Under stones, at low water, and among *Melobesia* on the rocky shore. 30/XI. 1914. Numerous specimens.

Figure 8 Isl., Carnley Harbour, Auckland Isl., under stones, at low water 2/XII. 1914. Several specimens.

Perseverance Harbour, Campbell. Isl.; under stones, at low water 9/XII. 1914. 1 specimen.

A closer examination of these specimens, taken on the type-locality of Dendy's *Chiridota benhami,* has made it clear that the latter species cannot be distinguished from *Trochodota dunedinensis.*

The characters given by Dendy as distinguishing *benhami* from *dunedinensis* are these; The digits of the tentacles do not increase gradually in size from base to apex, the terminal pair being considerably larger than any of the others; the diameter of the wheels is only about half the size of those of *dunedinensis* (0.053—0.067 mm in diameter, against about 0.16 mm); the wheels are numerous in *dunedinensis*, few and scattered in *benhami*, and the inner margin of the rim of the wheels is much more finely toothed in *dunedinensis* than in *benhami*, there being about 100 teeth in the former, only 35—40 in the latter. These would certainly be very good distinguishing characters, if they did hold good; but the rich material in hand shows that they do not hold good.

The digits of the tentacles increase very gradually in size from base to apex; according to the state of contraction they may all be quite short and thick or long and slender, the terminal ones being, of course, the longest. The wheels are generally rather numerous, especially in the larger specimens; their size varies from 0.06 to 0.16 mm, 0.10 to 0.14 being the usual size. So small as 0.53 I have

not seen them, and the sizes of 0.06 and 0.16 I have found only very rarely. Also in *dunedinensis* (from type locality) they may be, at least, as small as 0.08 mm. Almost constantly the inner margin of the rim of the wheels was found to be very finely toothed, with ca. 100 teeth in the whole circumference; only once a wheel was observed with only ca. 70 teeth, the other wheels of the same specimen having the usual number, and in one young specimen, with very few wheels (6 in the whole animal), all very small (0.06 mm), there were only ca. 50 teeth. A coarse dentation as that figured by Dendy (Pl. VI.$_{3.e}$) I never observed. The wheels are confined to the three dorsal interradii; only at the posterior end a few wheels may occur also in the two ventral interradii. The sigmata are very numerous, scattered, not arranged in papillæ. As pointed out by Perrier (Op. cit.) they lie mostly transversally directed.

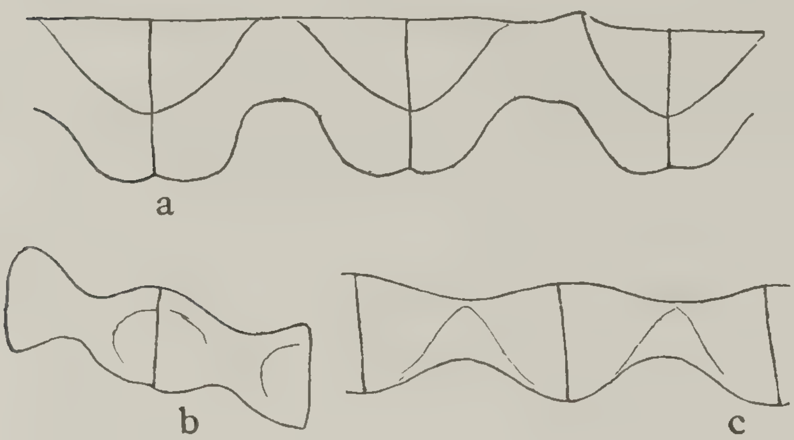


Fig. 59. Pieces of calcareous ring of *Trochodota Dendyi* (a), *Tr. dunedinensis* (b), and *Tr. dunedinensis*, var. *microurna*. (c). a. $^{25}/_{1}$, b. $^{22}/_{1}$, c. $^{16}/_{1}$.

Some additional information about this species may be given. The size of the specimens in hand varies from ca. 1.5 to 4.5 cm (in a well preserved condition). The skin is smooth, not papillate, except when strongly contracted. The colour of the living specimens was reddish-brown, small spots of this colour being still observable in some of the preserved specimens. An oval brownish spot at the base between each pair of tentacles.

The anterior end is, in well preserved specimens, distinctly oblique in the dorso-ventral direction, the dorsal side being the more prominent. Also the dorsal tentacles are somewhat longer than the ventral ones. The mouth is a narrow slit, distinctly excentrical, adjoining the ventral side of the oral disk. Also the calcareous ring is distinctly oblique, parallel to the oral disk. The 10 pieces are, in accordance herewith, somewhat unsymmetrical; they are narrow, the radial pieces not perforated by the nerve (Fig. 59.b). The alimentary canal is stated by Dendy to exhibit three limbs, forming the usual S-shaped figure, being otherwise a good deal

sacculated, in *benhami,* while in *dunedinensis* it is stated to run straight from mouth to anus, only slightly convoluted (through the contraction of the body). This would appear to be a too important difference for specimens of one and the same species. I do not think so, however, because the loop which may be found in some specimens is not of the same morphological value as that found in other Holothurians, but merely accidental folds of the much convoluted alimentary canal. It is not found in all specimens; sometimes, on the other hand, there are two of them, one above the other, both in the posterior part, at the passage from the intestine into the rectum. The oesophagus is, in accordance with the character of the mouth, strongly compressed laterally; it is very short, without any muscular swelling. The dorsal mesentery continues directly unto the rectum, which latter is suspended by two strong mesenteries, attached to the ventro-lateral radial muscles; the dorsal mesentery is passing into the left of these rectal mesenteries. In one case the right rectal mesentery was found attached to the right dorso-lateral radial muscle.

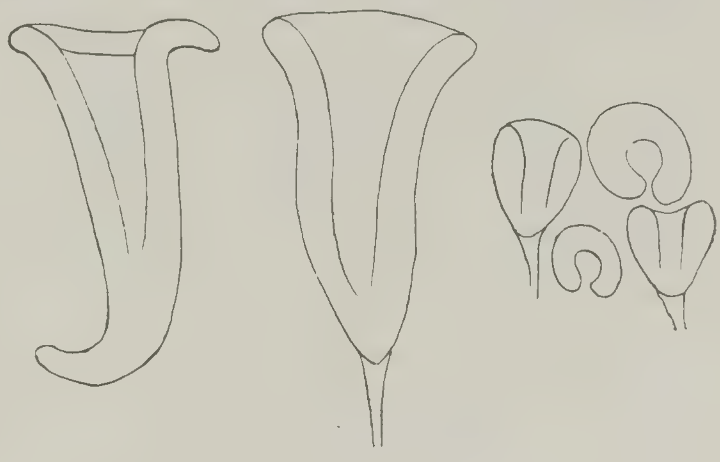


Fig. 60. Ciliated funnels of *Trochodota Dendyi* (a), *Tr. dunedinensis* (b) and *Tr. dunedinensis*, var. *microurna* (c); in the last figure two of the funnels are figured as seen from above. 190/1.

Regarding the radial muscles D e n d y states that (*in dunedinensis*) "there are, of course, no retractor muscles" (1897; p. 27). However, the anterior end of the longitudinal muscles is so strongly compressed and marked off from the part lying in the plane of the body wall that it is very tempting to regard this part as a true retractor muscle; but this compressed part is not entirely separated off from the part of the muscle following the body wall, and thus it may be maintained to be not directly homologous to the retractor muscle of Dendrochirotes. The retractor-part of the radial muscle begins at about $^1/_3$ of the body length from the anterior end, gradually increasing in height forwards.

The ciliated funnels are stated by D e n d y to be scattered singly in the neighbourhood of the dorsal mesentery. It appears that

normally they occur only along each side of the mesentery and in a series in the left dorso-lateral interradius; but then, further, they may occur along both sides of the left ventral interradius, along the radial muscles, and finally in some specimens there are 10 longitudinal series of ciliated funnels, one along each side of all the radial muscles. Their shape and size is given in fig. 60.b.

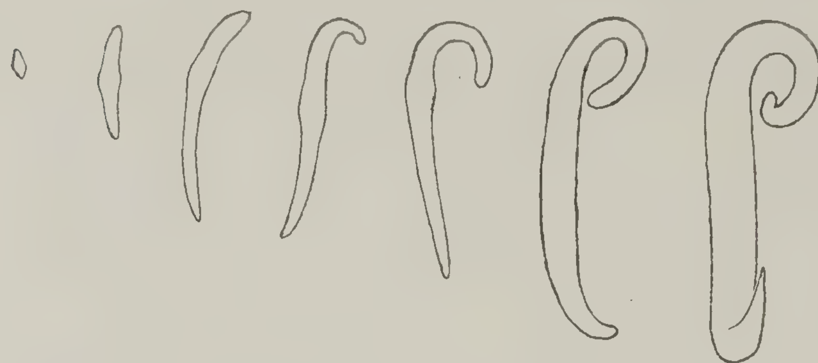


Fig. 61. Series of developmental stages of hooks of *Trochodota dunedinensis.* $^{220}/_1$.

The gonads are rather short, generally bending forwards so as to lie wholly in the anterior end of the body. The eggs are small, ca. 0.2 mm in diameter, which might indicate that this species may have pelagic larvæ.

The development of the wheels has been described by Dendy (1897); it is, indeed, very easy to find all the different developmental stages scattered among the fully formed wheels. Also developmental stages of the sigmata occur in considerable numbers, so that it is very easy to trace them from the first simple, straight spicule with a slight median thickening, through the beginning curvature to the fully formed hook (Fig. 61).[1])

Regarding Dendy's *Chiridota geminifera* I agree with Clark (1921. p. 165) that the evidence available is altogether too insufficient for accepting this form as a separate species (or even belonging to another genus than *Trochodota,* as it would, evidently, if it should definitely prove to be provided only with sigmoid spicules, lacking completely the wheels). Until further material is at hand it is the safest course to regard it as, probably, only a synonym of *Tr. dunedinensis.*

Dendy (Op. cit. 1896) suggested that the *Chiridota australiana* Stimpson recorded by Théel ("Challenger". Holoth. II. p. 16) as doubtfully from New Zealand might probably be identical with *Tr. dunedinensis.* Ludwig, however, has shown definitely (1898. Holoth.

1) A similar series of developmental stages was figured and described by Ludwig for *Tæniogyrus (Chiridota) contortus* and *Trochodota purpurea* (Holoth. Hamburger Magalh. Sammelreise, 1898; p. 79. Taf. III.37; p. 85. Taf. III.45.).

Hamburg. Magalh. Sammelreise, p. 86) that it is identical with *Troch. purpurea* (Lesson), the locality being the Falkland Islands, not New Zealand.

From off Moko Hinau, 5 fms (30/XII. 1914) there are two specimens which differ from typical *dunedinensis* in having 12—14 digits on the tentacles (against 8—10 in the typical form), in the calcareous ring having a somewhat different form (Fig. 59.b; to compare with Fig. 59.c.) and in the ciliated funnels being distinctly smaller (Fig. 60.b to compare with Fig. 60.c). The genital organs are in a very imperfect stage of development; it is therefore probable that the two specimens which measure ca. 50 mm (well extended) are not yet fully grown, and thus would appear to reach a larger size than the typical *dunedinensis,* in which the genital organs are fully developed already at a length of ca. 25—30 mm.

Very probably these specimens represent another species; but since it is, in any case, very closely related to *dunedinensis*, and as only two specimens are at hand, I think it the better course, for the present, at least, to designate this form only as a variety of *dunedinensis*, naming it var. **microurna** n. var.

25. *Trochodota Dendyi* n. sp.

Plimmerton; sandy beach, at low water. 15/I. 1915. 3 specimens.
Waikeke, Auckland Harbour. 3 specimens (from Mr. W. R. B. Oliver).
Paterson Inlet, Stewart Island. VII—IX. 1899. 3 specimens (Dr. G. M. Thomson).

The specimens from Plimmerton (the type) are 7—8.5 cm long, by a diameter of ca. 3—4 mm in the anterior end, the posterior end being somewhat narrower. The specimens from Auckland Harbour are very much larger, the longest ca. 18 cm, although in a rather contracted state; diameter in the anterior end 5 mm; the posterior end is somewhat thicker on account of the rectum being full of coarse sand. Those from Stewart Island are in a very poor condition, strongly contracted. The specimens from Plimmerton are white, those from Auckland Harbour with a faint purplish tint.

Tentacles with 6 pairs of digits, increasing in length towards the end of the tentacle, the distal pair being distinctly the longest. Mouth not in the shape of a dorsoventral slit. No distinct yellow

spots between the tentacles. The skin is closely and distinctly papillate, the papillæ being supported each by a group of hooks, generally 3—6 in each papilla (Fig. 62). When the skin is very much distended, the papillæ are indistinct, but the arrangement of the sigmata in groups remains distinct enough. Sometimes, in the larger specimens, the hooks are very scarce in the anterior part of the body, the papillæ here having only one hook or none at all. Along the radii the hooks generally are more numerous and may form a close series, less distinctly arranged in groups, along each side of the radial muscle. Size of the hooks ca. 0.08—0.14 mm; their shape not especially characteristic. In the dorsal interradii numerous wheels are found scattered, in the Plimmerton specimens. In the larger specimens from Auckland Harbour and Stewart Island they are much more scarce; in one of them I have discovered only one single wheel, even abnormal in structure. The size of the wheels varies considerably, from 0.04 to 0.1 mm, samples of these various sizes being found especially among one another in the posterior end of the body in one of the Plimmerton specimens. The rim of the inner margin of the wheel with some 100 teeth, as in the wheels of *Chiridota nigrà* and *carnleyensis* from which they do not differ noticeably. The spicules of the tentacles bifid in the ends (Fig. 63.a).

Fig. 62. Papilla with hooks of *Trochodota Dendyi*. 150/1.

The calcareous ring not very solid, the pieces being easily split in hypochlorite of sodium. A distinct notch in the hind edge of each piece; radials imperforate (Fig. 59.a). The radial muscles with a distinct retractor-part, connected with the body wall through a membrane of connecting tissue, looking, in well extended specimens, like a sort of mesentery. Oesophagus rather short, without a muscular swelling. The alimentary canal straight, without any loop; it is somewhat

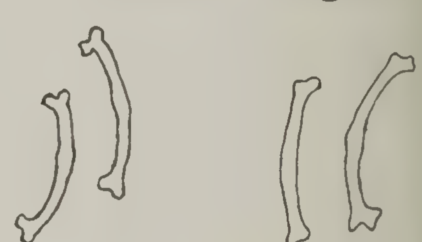


Fig. 63. Spicules from tentacles of *Trochodota Dendyi* (a) and *Kolostoneura novæ-zealandiæ* (b). 275/1.

folded. There is 1 Polian vesicle and 1 stone canal. Ciliated funnels (Fig. 60.a) only in the right dorso-lateral interradius, where they are arranged in a close series along the ventro-lateral radial muscle. Gonads a few slightly branched, very long tubes, which fill up the body cavity nearly to the end of the intestine. The genital duct opens upon a small papilla between the bases of the dorsal tentacles. The eggs are very small (ca. 0.01 mm) and very numerous which indicates that this species may probably have a typical pelagic larva (Auricularia).

The three localities: Auckland Harbour, Plimmerton and Stewart Island, indicate rather certainly that the species is distributed along all the coasts of New Zealand.

Evidently this species is nearly related to *Trochodota japonica* (v. Marenz.), and since the latter species is recorded from Port Jackson, the suggestion lies at hand that they might be identical. This they are, however, not. Having myself collected some specimens of the species in question, I have been able to undertake a direct comparison between the New Zealand and the Port Jackson specimens; the result is that they can by no means be regarded as identical. The Port Jackson species differs from the New Zealand species in its colour, in the more numerous sigmata in the papillæ, in the digits of the tentacles being all nearly of the same, considerable length, in the spicules of the tentacles being very scarce and not divided at the ends. A closer study of its anatomy may disclose more points of difference, but what has been pointed out already will suffice to show definitely that the two forms are not identical. I also doubt very much whether the Port Jackson species is really identical with *Trochodota japonica*, but as I have no material for comparison of the Japanese form, I shall not try to decide this question, which does not concern us directly here.

I dedicate this new species, which represents a very interesting addition to the New Zealand fauna, to the late Professor Dendy, to whose studies we owe most of our knowledge of New Zealand Holothurians.

26. *Kolostoneura novæ-zealandiæ* (Dendy & Hindle).

Rhabdomolgus novæ-zealandiæ. Dendy & Hindle. 1907. Add. Knowl. N. Z. Holoth. J. Linn. Soc. Zool. XXX. p. 113. Pl. 11.1—4 Pl. 13.16—17. Pl. 14.22—29.

Kolostoneura novæ-zealandiæ. S. Becher. 1909. Die systematische Stellung des *Rhabdomolgus novæ-zealandiæ*. Arch. Zool. expér. & génér. (5) I. Notes & Revue. p. XXXIII—XLIII.

— -- H. L. Clark. 1921. Echinoderms of the Torres Strait. Dep. Mar. Biology. Carnegie Inst. Washington. X. p. 164.

Akaroa Harbour; under stones, at low water. 14/XII. 1914. 4 specimens.
Plimmerton; — -- 15/1. 1915. 18 specimens
Takapuna Beach, Auckland. — 23/XII. 1914. 1 specimen.
Stewart Island. 1908. 1 specimen (received from Professor Benham).

The largest of the specimens in hand measures 8 cm in length, corresponding thus very well to the estimate of the size of the living animal given by Dendy & Hindle. (The specimen is preserved in a very well extended state.)

To the very careful description given by Dendy & Hindle I have only little to add. An important fact is that the tentacles contain, almost constantly, calcareous spicules[1]) of the usual form Fig. 63.b; only in two specimens I was unable to find any; in some specimens they are fairly numerous. — In the preserved specimens the posterior end rather commonly is found to be somewhat swollen and the cloaca evaginated, which makes these specimens look rather peculiar, *Edwardsia*-like. The ciliated funnels may be very scarse or even wanting along the mesentery. Dendy & Hindle state them to occur also on the longitudinal musclebands, without stating more exactly on which of them. I have found them to occur along the right side of the mid-ventral and along the upper side of the left latero-ventral muscle. There is a distinct retractor part of the usual shape, the elevated part of the muscle beginning at about a centimeter's distance from the anterior end. — The eggs are small, ca. 0.1 mm, which may indicate that this species has a true pelagic larva. — Two of the specimens from Plimmerton are infested with an ectoparasitic snail.

The new localities given here, together with those given by

[1]) This fact has some practical importance, the existence of spicules in the tentacles giving definite proof that the absence of spicules in the body wall of such specimens is not due to the preserving fluid having been acid and thus caused their disappearance.

Dendy & Hindle, indicate that this species is distributed, like the preceding species, all round the coasts of New Zealand.

I fully agree with Becher that this species is no true *Rhabdomolgus.* H. L. Clark expresses the opinion that it is derived from *Trochodota* by loss of the wheels and the sigmata. I think it beyond doubt that Clark is right in this suggestion, and I can give some proof of its correctness. In the specimen from Takapuna Beach, which I am otherwise unable to distinguish from the Plimmerton specimens, I have found a few hooks in the skin. In one of the two specimens from Plimmerton, infested with parasitic snails, I even find both hooks and wheels. Now, this specimen is a very small one and in a very poor condition, perhaps because of the parasites, and the identification is not certain; but as it does not at all look like the specimens of *Trochodota Dendyi,* found at the same locality, I think it rather probable that it is really a specimen of *Kolostoneura* which has, through the influence of the parasites, developed the calcareous bodies of its ancestor.

If, then, we have a separate genus, *Anapta,* for the Synaptas without anchors, another genus, *Achiridota,* for the Chiridotas without wheels, we should, consequently, have a separate genus also for the Trochodotas without hooks or wheels, and we must there accept the name *Kolostoneura*, proposed for it by Becher, even if we may regret that he did not use the name analogous to *Anapta* and *Achiridota* which he had first planned to use, *Asigma*, but one which does not a priori convey any idea at all of its relationships. The name *Kolostoneura* refers to the statement of Dendy & Hindle that the radial nerve disappears even before reaching the level of the calcareous ring. But I cannot help expressing some doubt as to the general validity of this statement; at least, I find in some sections from the middle of the body of a specimen of *Kolostoneura* the radial nerve quite distinct in places, such sections recalling very much the fig. 18, Taf. II of Hamann's“ Histologie d. Echinodermen”, which shows a transverse section of the body wall, with the radial nerve, of *Synapta (Labidoplax) digitata.* It has very much the appearance that the nerve lies within the layer of circular muscles, with muscular substance both externally and internally to the nerve; this might well account for the fact, that the nerve is quite indistinct in places. I must content myself with these indications, this

being not the place for a detailed study of the finer structure of the nervous system, for which my material is also quite insufficient. But, evidently, here are some problems which might well deserve being taken up for a closer investigation.

V. Crinoidea.

No Crinoid was known from New Zealand seas, until in 1916 A. H. Clark[1]) made known a species found by Mr. Percy Seymour in Preservation Inlet, on the West Coast of the South Island, which was sent him for determination by Professor Benham. It was named *Comanthus trichoptera benhami,* being regarded by Dr. Clark as representing merely a variety of the Australian species *Comanthus trichoptera* (Joh. Müller).

During the author's investigations in New Zealand seas another Crinoid was obtained off Three Kings Island, and specimens of a third species were obtained from Captain Bollons, who had dredged them in the same region. Specimens of these two forms were also submitted to Dr. A. H. Clark, who described them as *Comanthus novœ-zealandiae* and *Argyrometra mortenseni.*[2])

For the present then only these three species (— *Comanthus benhami* being later on thought by Dr. Clark to be entitled specific rank —) are known to occur in New Zealand seas. That more species will ultimately be found there can hardly be doubted; especially the deeper parts of Cook Strait and the Sea off North Cape and Three Kings Islands may be expected to yield a rich harvest, also in Crinoids.

I shall give here some figures and a few supplementary remarks on two of these species, *Comanthus benhami* being available only in one specimen in a very poor condition, lent me by Prof. Benham.

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1) A. H. Clark. The first New Zealand Crinoid. Proc. Biol. Soc. Washington. XXIX. 1916. p. 48.

2) A. H. Clark. A new Crinoid from New Zealand, and another from Tasmania. Ibidem. XXXI. 1918; p. 41.
A. H. Clark. A revision of the Crinoid family Antedonidæ, with the diagnoses of nine new genera. Journn. Washington Acad. Sci. VII. 1917. p. 127.

1. *Comanthus novæ-zealandiæ* A. H. Clark.

(Figs. 64.a–b; 65.a–c).

Comanthus novæ-zealandiæ. A. H. Clark. 1918. A new Crinoid from New Zealand, and another from Tasmania. Proc. Biol. Soc. Washington. 31. p. 42.

Off Three Kings Islands, 65 fms; hard bottom. 5/I. 1915. 6 specimens.

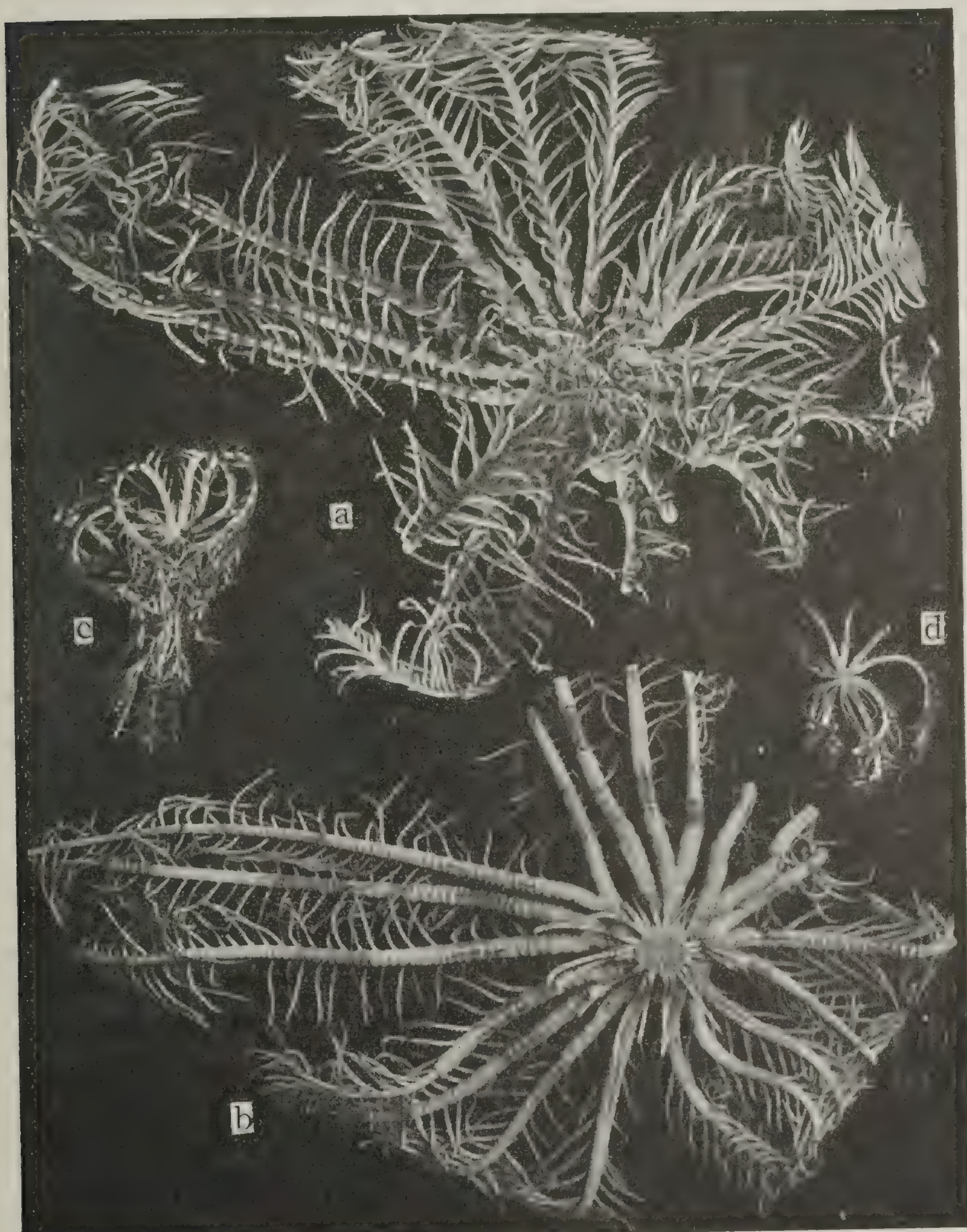
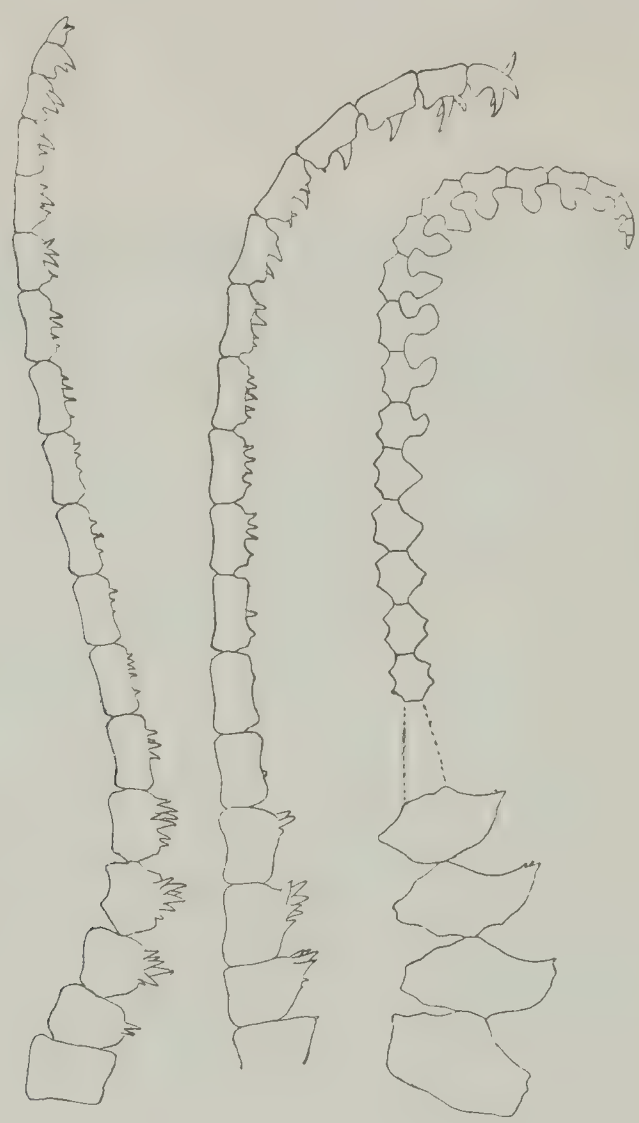


Fig. 64. *Comanthus novæ-zealandiæ*, from the oral (a) and the dorsal side (b); *Argyrometra mortenseni*, side view (c) and from the dorsal side (d). Nat. size.

While the number of arms is, evidently, normally 20, one of my specimens has only 18, two only 19 arms. The figures 65.a—c show the peculiar serration of the pinnules.



a. b. c.

Fig.65. *Comanthus novæ-zealandiæ*; genital pinnules (a—b) and oral pinnule (c); the latter shows only the basal and outer joints, 16 joints having been omitted in the middle. 15/1.

The number of the arms, 18—20, makes this species easily distinguishable from the otherwise very similar *Comanthus Benhami*, which has ca. 30 arms. (The type specimen had 28, the specimen lent me by Prof. Benham had probably 38 arms.

2. *Argyrometra mortenseni* A. H. Clark.

(Figs. 64.c—d ; 66)

Argyrometra mortenseni. A. H. Clark. 1917. A Revision of the Crinoid family Antedonidæ. Journ. Wash. Acad. Sc. VII. p. 129.

Off North Cape, 60 fms. 5 specimens (Captain Bollons).
Off Three Kings Isl., 95 fms. 2 specimens (Captain Bollons).

The figures give sufficient information about the general features of this species. It may be pointed out that the number of

Fig. 66. *Argyrometra Mortenseni.* 6/1.

joints in the first pinnules is not constantly 12, as given in the original description. One may find 8 joints in the first, 10 in the second pinnule; the number of joints in the cirri is generally 12—16, the number 17 given in the original diagnosis is more rarely met with.

On one of the specimens from 95 fms two Myzostomas were found.

Appendix.

Goniocidaris umbraculum (Hutton). In the "New Zealand Journ. of Sci. & Technology" Vol. VII.3. p. 189 (Sept. 1924) Maxwell Young has published a note on the "Occurrence of the Echinoderm Goniocidaris umbraculum Hutton" in which he records numerous specimens from E. N. E. off Otago Heads, 60 fathoms. His statement that "the species has previously been recorded from Foveaux Strait and Stewart Island" seems to show that he has not seen my report on the New Zealand Echinoidea, in which the species is recorded also from the Cook Strait (p. 146). Had he seen that report, he would probably also have avoided turning his specimens upside down, as he has evidently done, since he states that the spines "on top are of the usual shape, but the ones on the underside are dilated at the tip so as to form a concave terminal disc".

Fig.67. Tridentate pedicellaria of *Echinocyamus polyporus*. 200/1.

Echinocyamus polyporus Mrtsn. In my description of this species I was unable to give any information about the characters of the spines and pedicellariæ, all my specimens being naked tests. Professor Benham having since then sent me a pair of alcoholic specimens, I can here supply some of the information lacking.

The spines are not very characteristic. The primary spines are clubshaped, very nearly smooth, ca. 0.5 mm long. Those near the peristome and the periproct are elongated, c. 1.5 mm long, slender, slightly curved. The miliary spines have a smooth crown, or there may be a faint indication of serrations. — Of the pedicellariæ I have only succeeded in finding the tridentate form (Fig. 67); the valves are narrow, the blade closed in the lower half; the edge of the outer, open part faintly dentate.

Clypeaster virescens Döderlein. According to the kind information of my friend H. Lyman Clark there are in the British Museum

2 fine specimens of this species from off New Zealand, collected by the "Terra Nova" Expedition; they were forgotten in Bell's report. The species was recorded from the N. S. Wales Coast in H. L. Clark's report on the "Endeavour" Echinoderms (p. 119); its occurrence in New Zealand seas is thus not so very surprising.

Echinobrissus recens (M. Edw.)[1]) H. L. Hawkins has recently established a new genus *Apatopygus* for this species, in a very interesting and important paper[2]) which was not, and, on account of the rather exasperating state of scientific records of those years immediately after the great war, hardly could be known to me by the time my paper on the New Zealand Echinoids was published. While I fully agree with Hawkins that the New Zealand species cannot be referred to the genus *Oligopodia* to which it was referred by H. L. Clark, but must form a separate genus, I am not so very glad to adopt the name *Apatopygus* instead of *Echinobrissus*. It may be that according to the rules of nomenclature the name *Echinobrissus* does not rightly belong to the New Zealand species, *E. recens;* but this seems to me to be a case where exemption from the rules might be desirable. Accordingly, in order both to call attention to the name proposed by Hawkins and to keep in mind the old name I shall for the present designate the New Zealand species *Apatopygus (Echinobrissus) recens.*

Ophiomyxa brevirima H. L. Clark. The statement that this species is viviparous is given (Ophiuroidea, p. 97 and 113) as a new discovery. In fact, this was observed as long ago as 1898 by Farquhar (On the Echinoderm fauna of New Zealand. Proc. Linn. Soc. N. S. Wales. 1898. p. 303), which I had overlooked.

In the same place Farquhar also makes the statement about **Pectinura cylindrica** that it is viviparous. I must confirm this statement, and, furthermore, I find that also **Pectinura gracilis** is viviparous. In both species only a single young is found at a time in a bursa, and apparantly only in some of the bursae, not in all of them, at the same time. Both species likewise are

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1) In the paper on the Echinoidea (p. 184) the author-name has been misprinted as (Mr. Edw.)

2) H. L. Hawkins. Morphological Studies on the Echinoidea Holectypoida and their Allies. X. On Apatopygus gen. nov. and the affinities of some recent Nucleolitoida and Cassiduloida. Geol. Magaz. LVII. 1920. p. 393.

hermaphroditic. In *P. cylindrica* there is a single ovary at the distal end of the bursal slit, at the adradial side, and one or two testes at the proximal end of the slit, at the abradial side. In *P. gracilis* there are 1—3 genital organs at the adradial and a series of upto 6 along the abradial side of the slit; it appears that the ovaries and testes occur among one another, without definite order.

The eggs seem to be remarkably small for viviparous Ophiurids, only ca. $0._{25}$ mm — but the eggs observed may possibly not be so nearly ripe, and thus may perhaps grow to a somewhat larger size, before they are ripe.

It is a highly interesting fact that thus no less than three new viviparous and hermaphroditic Ophiurans: *Amphiura annulifera* and the two *Pectinura*-species, have been discovered among the New Zealand Ophiurids, against only one, *Ophiomyxa brevirima*, with separate sexes. This fact greatly emphasizes the relation between viviparity and hermaphroditism that the author has previously shown to exist in Ophiurids ("On Hermaphroditism in viviparous Ophiuroids". Acta Zoologica. I. 1920).

Ophioplocus Huttoni Farquhar. In his report on the Ophiuroids of the Australasian Antarctic Expedition (Vol. $VIII._2$. 1922. p. 47) Koehler has established, for an antarctic species, *O. incipiens* Koehler, the genus *Ophioceres*, related to *Ophioplocus* but differing from the latter genus in the breaking up of the dorsal plates being not carried so far, and in the presence of only one tentacle papilla. To this genus he also refers the New Zealand species, evidently with full right. The name of the New Zealand species will then be *Ophioceres Huttoni* (Farquhar).

In February—April 1924 the Swedish Zoologist Sten Vallin, partaking in a Whaling-Expedition to the Antarctic Sea, had the opportunity of collecting some Echinoderms also at Campbell Island (Perseverance Harbour) and at Stewart Island (Paterson Inlet). These specimens were kindly placed at my disposal by my friend Professor O. Carlgren, Lund. Besides the very interesting new Holothurian, *Psolidiella nigra*, described above, the collection proved to contain nothing of special importance. The species collected were the following:

Campbell Island: *Calvasterias lævigata* (Hutton), *Henricia lukinsii* (Farquhar), *Amphioplus basilicus* (Koehler), *Cucumaria leoninoides* Mrtsn.

Stewart Island: *Asterina regularis* Verrill, *Calvasterias Suteri* (de Loriol), *Coscinasterias calamaria* (Gray), *Ophionereis fasciata* Hutton, *Amphipholis squamata* (D. Ch.), *Pectinura maculata* (Verrill), *Pect. gracilis* Mrtsn., *Psolidiella nigra* Mrtsn.

In the Narrative of his Fiji—New Zealand Expedition (Univ. of Iowa Studies. Studies in Natural History. X. Nr. 5. 1924, p. 206—8) Professor C. C. Nutting mentions some Echinoderms dredged in the Hauraki Gulf. It would appear that there is a new Comatulid, perhaps also a new Asteroid (apparently allied to *Pentagonaster pulchellus*) and an Ophiurid "with a leathery disk" allied to *Ophiocoma*. Although nothing definite can be said about these forms from the brief preliminary mention given in the narrative quoted, I have thought it proper to call attention here to these presumable additions to the New Zealand Echinoderm fauna.

Zoogeographical remarks on the Echinoderm fauna of New Zealand and the Auckland-Campbell Islands.

It may be practical to begin this chapter on the zoogeographical relations of the New Zealand Echinoderm fauna with a list of all the species known with certainty to occur in New Zealand seas, with a tabellaric view of their distribution.

As appears from this list no less than 98 of the total number of 119 species known from New Zealand seas, or 82.4 %, are not known to occur outside the New Zealand area, taken in a wider sense so as to include, besides the Chatham and Auckland-Campbell Islands, also the Macquarie and Kermadec Islands. This truly astonishing high percentage of endemic forms most probably will ultimately be somewhat reduced, partly, because it is to be expected that some of the species hitherto known only from the deeper water off the North of the

List of the Echinoderms of New Zealand and the Auckland-Campbell Islands.

Name	New Zealand: North Isl.	New Zealand: Cook Str.	New Zealand: South Isl.	New Zealand: Stewart Isl.	Auckland Isl.	Campbell Isl.	Chatham Isl.	Kermadec Isl.	Australia	Macquarie Isl.	Magellanic Region	Remarks
1. *Goniocidaris umbraculum* (Hutton)		+	+	+								
2. *Ogmocidaris Benhami* Mrtsn.	+											
3. *Aræosoma thetidis* (H. L. Clark)	+								+			
4. *Notechinus novæ-zelandiæ* Mrtsn.			+	+		+				+		
5. *Pseudechinus albocinctus* (Hutton)	+	+	+	+								
6. — *Huttoni* Benham			+	+								
7. — *variegatus* Mrtsn	+											
8. — *grossularia* (Studer)	+											
9. *Holopneustes inflatus* Ltk.	+								+			
10. *Evechinus chloroticus* (Val.)	+	+	+	+								
11. *Heliocidaris tuberculata* (Lamk.)	+							+	+			
12. *Echinocyamus polyporus* Mrtsn.		+						+				
13. *Clypeaster virescens* Döderlein	+								+			
14. *Arachnoides zelandiæ* Gray	+	+										
15. *Laganum depressum* (Ag.)	+								+			Identification not beyond doubt.
16. *Peronella hinemoæ* Mrtsn	+											
17. *Apatopygus* (*Echinobrissus*) *recens* (M. Edw.)		+		+								
18. *Echinocardium australe* Gray	+	+	+	+					+			
19. *Brissopsis zealandiæ* Mrtsn	+											
20. *Ophiocreas constrictum* Farquh.			+						+			
21. — *longipes* Mrtsn.	+								+(?)			
22. *Astrotoma Waitei* Benham			+									
23. — *Benhami* Bell	+											
24. *Astroporpa Wilsoni* Bell	+											
25. *Astroceras elegans* (Bell)	+											
26. *Gorgonocephalus chilensis*, var. *novæ-zelandiæ* Mrtsn.		+										Typical form in the magellanic region.
27. *Ophiomyxa brevirima* H. L. Cl.	+	+	+	+	+							

28.	[illegible]									+			Also Malay Archipelago.
29.	*Ophiothrix aristulata* Lym.	+											
30.	— *Oliveri* Benham	+											
31.	*Ophiocormus notabilis* H. L. Cl.		+										
32.	*Ophiocoma Bollonsi* Farquh.	+	+						+				
33.	*Ophiopteris antipodum* E. A. Sm.	+	+										
34.	*Ophiactis resiliens* Lym.	+	+							+			
35.	— *hirta* Lym.		+							+			
36.	— *profundi* var. *novæ-zealandiæ* Mrtsn.	+	+										Typical form probably all over the Pacific.
37.	*Amphiura magellanica* Ljg.		+	+	+	+						+	
38.	— *spinipes* Mrtsn.	+											
39.	— *præfecta* Koehler					+	+						
40.	— *aster* Farquh.	+	+	+									
41.	— *noræ* Benham	+					+						
42.	— *eugeniæ*, var. *latisquama* Mrtsn.	+											Typical form in the magellanic region.
43.	— *rosea* Farquh.	+	+	+	+								
44.	— *amokuræ* Mrtsn.	+		+			+						
45.	— *alba* Mrtsn.	+											
46.	— *hinemoæ* Mrtsn.	+											
47.	— *annulifera* Mrtsn.	+											
48.	— *pusilla* Farquh.		+	+									
49	*Amphiocnida pilosa* (Lym.)	+								+			
50.	*Amphioplus basilicus* (Koehler)			+		+	+						
51.	*Ophionephthys stewartensis* Mrtsn				+								
52.	*Amphipholis squamata* (D. Ch.)	+	+	+	+	+			+	+			Cosmopolitan.
53.	*Ophionereis fasciata* Hutton)	+	+	+	+			+[1]	+[1]				[1] Probably this species.
54.	*Ophiozonoida picta* H. L. Clark	+	+										
55.	*Ophioceres (Ophioplocus) Huttoni* (Farquh.)	+	+										
56.	*Pectinura cylindrica* (Hutton)	+	+					+					
57.	— *gracilis* Mrtsn.		+		+								
58.	— *maculata* Verr.		+	+	+			+					

Name	New Zealand: North Isl.	New Zealand: Cook Str.	New Zealand: South Isl.	New Zealand: Stewart Isl.	Auckland Isl.	Campbell Isl.	Chatham Isl.	Kermadec Isl.	Australia	Macquarie Isl.	Magellanic Region	Remarks
59. *Astropecten polyacanthus* M. Tr.	+	+							+			All over the Indo-Pacific.
60. — *dubiosus* Mrtsn.	+											
61. — *primigenius* Mrtsn.	+											
62. *Psilaster acuminatus* Sladen	+	+	+						+			? South Africa.
63. *Luidia varia* Mrtsn.	+											
64. — *neozelanica* Mrtsn.	+											
65. *Pentagonaster pulchellus* Gray	+	+	+	+			+					
66. *Diplodontias dilatatus* E. Perr.	(?)		+									
67. *Asterodon miliaris* (Gray)	+	+	+	+								
68. *Mediaster Sladeni* Benh.			+									
69. *Peridontaster Benhami* Mrtsn.			+	+								
70. *Eurygonias hylacanthus* Farquh.		+										
71. *Nectria pedicelligera* Mrtsn.	+											
72. *Ophidiaster kermadecensis* Benh.	+							+				
73. *Asterina regularis* Verr.	+	+	+	+								
74. — *aucklandensis* Koehler					+							
75. *Stegnaster inflatus* (Hutton)	+	+	+									
76. *Echinaster Farquhari* Benh.			+									
77. *Henricia lukinsii* Farquh.					+	+						
78. — *compacta* (Sladen)	+	+					+					
79. — — var. *aucklandiæ* Mrtsn					+	+						
80. *Calvasterias Suteri* (Loriol)			+	+	(+)					(?)		
81. — *lævigata* (Hutton)					+	+						
82. *Stichaster australis* (Verr.)	+		+									
83. *Allostichaster polyplax* (M. Tr.)	+	+	+	+			+		+			
84. — *insignis* (Farquh.)	(?)	+	+	+	+							
85. *Sclerasterias mollis* (Hutton)			+									
86. *Astrostole scabra* (Hutton)	+	+	+									
87. *Coscinasterias calamaria* (Gray)	+	+	+	+					+			All over the Indo-

89. *Holothuria neozelanica* Mrtsn.	+											
90. *Cucumaria brevidentis* (Hutton)	+		+	+	+		+					
91. — — var *carnleyensis* Dendy				+	+	+				(?)		
92. — *calcarea* Dendy	+	+		+							+[1])	[1]) Juan Fernandez
93. — *leoninoides* Mrtsn.					+	+						
94. — *amokuræ* Mrtsn.				+	+							
95. — *Farquhari* Mrtsn.	+											
96. — *Bollonsi* Mrtsn.	+											
97. — *alba* (Hutton)	+	+	+	+								
98. — *ocnoides* Dendy		+	+									
99. — *Huttoni* Dendy			+									
100. *Phyllophorus longidentis* (Hutton)	+	+	+									
101. — *dearmatus* Dendy & Hindle		+	+						+			
102 *Pseudocucumis Thomsoni* (Hutton)				+								
103. — *bicolumnatus* Dendy & Hindle			+									
104. *Pseudopsolus macquariensis* (Dendy)				+[1])						+		[1])Locality perhaps not wholly reliable.
105. *Psolidiella nigra* Mrtsn.				+								
106. *Psolus neozelanicus* Mrtsn.	+											
107. *Caudina coriacea* (Hutton)	+	+										
108. *Molpadia Marenzelleri* Théel	+											
109. — *Dendyi* Benham			+									
110. *Protankyra uncinata* (Hutton)	+	+										
111. *Chiridota gigas* Dendy			+				+		+			
112. — *nigra* Mrtsn.				+	+							
113. — *carnleyensis* Mrtsn.					+							
114. *Trochodota dunedinensis* (Parker)			+	+	+							
115. — *Dendyi* Mrtsn.	+			+								
116. *Kolostoneura novæ-zelandiæ* (Dendy & Hindle)	+		+	+								
117. *Comanthus Benhami* A. H. Cl.			+									
118. — *novæ-zelandiæ* A. H. Cl.	+											
119. *Argyrometra Mortenseni* A. H. Cl.	+											

North Island (especially off Three Kings Island) will prove to have a wider distribution (Australia), partly, because several of the species described in these papers are small and inconspicuous forms which are easily overlooked by collectors (e. g. the small Amphiurids). On the other hand, such reduction in the number of endemic species will probably be counterbalanced to some degree by the finding of new endemic species, as we may well feel sure that the list of New Zealand Echinoderms is still rather far from complete; even among the littoral forms new species are to be expected, not to speak of those of the deeper waters off the North end of the North Island or of the Cook Strait. But even allowing for a not inconsiderable reduction in the percentage of endemic forms a large number of characteristic forms remain which are not likely ever to be found outside the New Zealand area. As such I would especially name the following:

Goniocidaris umbraculum
Pseudechinus albocinctus
Notechinus novæ-zealandiæ
Evechinus chloroticus
Arachnoides zelandiæ
Apatopygus (Echinobrissus) recens
Ophiomyxa brevirima
Ophiocoma bollonsi
Ophiopteris antipodum
Ophioceres Huttoni
Pectinura cylindrica
— maculata
Astropecten primigenius
Pentagonaster pulchellus
Diplodontias dilatatus
Asterodon miliaris
Eurygonias hylacanthus
Asterina regularis
— aucklandensis
Stegnaster inflatus
Calvasterias Suteri
— lævigata
Stichaster australis
Sclerasterias mollis
Astrostole scabra
Cucumaria brevidentis
— leoninoides
— alba
— ocnoides
Kolostoneura novae-zealandiæ

This long list of highly characteristic forms bears testimony of the immense time during which New Zealand has been isolated. Especially the Echinoid *Apatopygus (Echinobrissus) recens*, the direct descendant of a group that flourished and was of worldwide distribution in Jurassic and Cretaceous times, in recent time known alone from New Zealand seas[1]), is of the greatest interest, a not

[1]) The record of its occurrence at Madagascar must be regarded as perfectly unreliable, resting probably on wrong labelling in old collections.

unworthy parallel to the Tuatara *(Hatteria)* among the land animals of New Zealand. Also *Astropecten primigenius,* the most primitive of all Astropectens, is highly interesting as, evidently, representing a survival from very remote times.

Among the genera endemic in the New Zealand region I would point out as the more important, besides *Apatopygus: Pseudechinus* and *Evechinus.* Especially interesting is *Pseudechinus,* which has developed into a rather flourishing group of no less than four species. As stated in the report on the Echinoidea (p. 167) it is not improbable that a fifth species of the genus occurs in the Australian seas, which probably means that the group has spread from its original home, the New Zealand seas, into the Australian seas, not inversely.

In the "Subantarctic Islands of New Zealand" the number of Echinoderms recorded from the Auckland—Campbell Islands amounts to 8; through the author's researches the number is now raised to 19 species, given in the following list. (The letters A = Auckland Isl., and C = Campbell Isl., indicate from which of these islands each species is known).

Notechinus novæ-zealandiae (C.)
Ophiomyxa brevirima (A.)
Amphiura magellanica (A.)
— præfecta (A. C.)
— amokuræ (C.)
Amphioplus basilicus (A. C.)
Amphipholis squamata (A.)
Henricia lukinsii (A. C.)
— compacta, var. aucklandica (A.)
Asterina aucklandensis (A.)
Calvasterias lævigata (A. C.)
Allostichaster insignis (A.)
Cucumaria brevidentis (A.)
— — var. carnleyensis (A. C.)
— leoninoides (A. C.)
— amokuræ (A.)
Chiridota nigra (A.)
— carnleyensis (A.)
Trochodota dunedinensis (A.)

Of these 19 species 8, or 42 %, are endemic; of the rest of them 9 are otherwise known only from New Zealand, while one, *Amph. magellanica,* occurs also in the Magellanic region and another, *Amph. squamata,* is cosmopolitan. These facts show that, at least as far as the Echinoderms are concerned, the Auckland-Campbell Islands have no nearer relation to any other region than New Zealand, the sole species *Amphiura magellanica* not being of sufficient weight for proving a nearer relation to the Magellanic region, as this species may very easily have been transported on floating algæ.

Very probably several of the endemic species will ultimately be found to occur also at New Zealand (especially Stewart Island); but it would seem very likely that some of them, e. g. *Asterina aucklandensis, Calvasterias lævigata*, and probably also *Amphiura præfecta* and *Cucumaria leoninoides,* are truly endemic. Anyhow, the fact that this small area possesses endemic forms is most interesting, especially in view of the direct connection with New Zealand wich must have existed in the earlier Tertiary. That the very marked climatic conditions of these islands must have played an important role in the development of this endemic Echinoderm fauna can scarcely be doubted. Thus, we can well imagine that the two species of *Calvasterias,* the New Zealand *C. Suteri* and the Auckland-Campbell species *C. lævigata,* have developed from a form originally inhabiting the whole of the Southern part of the greater New Zealand continent. On the other hand species like *Asterina aucklandensis, Amphiura præfecta* and *Cucumaria leoninoides* have no close relation to any New Zealand species and may be supossed to have developed from forms inhabiting only the Southern coasts of the greater New Zealand continent.

The fact that only 8 species have been found at Campbell Island is probably due to this island being less accessible for investigations outside Perseverance Harbour. The difference in the number of species recorded from the two islands, therefore, has hardly any deeper zoogeographical meaning. The two species known alone from Campbell Island, *Notechinus novæ-zealandiæ* and *Amphiura amokuræ*, will, no doubt, prove to occur also at the Auckland Islands, since they are found also at New Zealand.

I may take the opportunity of mentioning in this connection that I found the New Zealand Enteropneust, *Dolichoglossus otagoensis* Benham — hitherto recorded only from the Otago coast, but occurring also at Island Bay, Wellington — in great numbers at the Auckland Islands, living among the leaves or crusts of *Melobesia antarctica* (Hook. & Harv.) on the steep rock wall of Masked Island, Carnley Harbour. This most interesting locality, upon the whole, is the home of a very rich animal community. The most conspicuous species is the beautiful red *Cucumaria brevidentis*, var. *carnleyensis,* which protrudes among the pale pink leaves of the alga, resembling strawberries. Very numerous,

but less conspicuous because of their dull colour, or because they live wholly concealed among the leaves of the alga, are *Cucumaria brevidentis* (the typical form), *Cuc. leoninoides, Amphiura magellanica, præfecta, Ophiomyxa brevirima, Henricia lukinsii, Trochodota dunedinensis,* various worms, e. g. *Steggoa brevicornis, Nereis australis, N. Mortenseni, Podarke angustifrons, Lumbriconereis magelhaensis, Polycirrus kerguelensis,* several Syllids.[1]) Also various small Crustaceans and some Actinians *(Edwardsia tricolor, Condylanthus aucklandicus).*[2]) Evidently, this luxurious growth of *Melobesia* thus offers a favourite place — perhaps no less a hiding place than a feeding ground — for a great variety of smaller animals. However, hardly any of these forms is exclusively bound to the Melobesia-locality, not being so specially adopted to life among the Melobesia-leaves as to be unable to thrive in other localities.

The Echinoderm fauna of Macquarie Island is still very insufficiently known; only as regards the Asteroids we have got some better information through the researches carried out there in 1913 by Mr. A. Hamilton as member of a research party left on the island by Sir Douglas Mawson, the leader of the Australasian Antarctic Expedition. In his Report on the Asteroidea of the said expedition R. Koehler records the following 6 species of sea-stars from Macquarie Island:

Sporasterias antarctica (Lütken)	Parastichaster sphærulatus Koehler
Parastichaster directus Koehler	Asterina Hamiltoni Koehler
— Mawsoni Koehler.	Cycethra macquariensis Koehler.

Benham ("Subantarctic Islands of New Zealand", p. 302) has recorded also *Calvasterias (Stichaster) Suteri* from Macquarie Island, likewise collected by Mr. Hamilton during a previous visit to the island. According to Koehler (Op. cit.) this is probably a mistaken identification of the species described by him as *Parastichaster Mawsoni.* — While it appears that no Ophiurids were collected at the Macquarie Island by Mr. Hamilton — at least none

1) H. Augener. Polychaeta von den Auckland-Campbell Inseln. "Papers from Dr. Th. Mortensen's Pacific Expedition". Nr. XIV.

2) O. Carlgren. Actiniaria from New Zealand and its Subantarctic Islands. "Papers from Dr. Th. Mortensen's Pacific Expedition". Nr. XXI.

are recorded in Koehler's work on the Ophiuroidea of the Australian Antarctic Expedition — I have been able to state the occurrence at the Macquarie Island of *Notechinus novæ-zealandiæ* (Echinoidea, p. 157). A Holothurian, *Pseudopsolus macquariensis,* was described from there by Dendy, and in the present paper is further recorded — though with some doubt as to the correctness of the locality — *Cucumaria brevidentis*, var. *carnleyensis*, while inversely *Pseudopsolus macquariensis* is recorded, likewise with some doubt as to the correctness of the locality, from Stewart Island.

Of these 8 species of Echinoderms thus far known from Macquarie Island at least five are endemic, three of them even belonging to an endemic genus. One, *Notechinus novæ-zealandiæ*, is widely distributed in the New Zealand region, another, *Sporasterias antarctica*, occurs in the Magellanic region, while a third species, *Cycethra macquariensis*, belongs to a genus characteristic of the Magellanic region, not represented in the New Zealand region proper. These facts bear testimony against any closer relation between the Macquarie Island and New Zealand, at least as far as their Echinoderm faunas are concerned. The occurrence of *Notechinus* also at Macquarie Island is very easily explained through the transport of the pelagic larvæ — its eggs are very numerous and small, only 0.08 mm, which proves beyond any doubt that it must have pelagic larvæ —, a transport which would hardly be impossible in recent times and still less so during the period of elevation of the great New Zealand Plateau in early Tertiary times, when the distance was considerably smaller. Also the — still somewhat problematic — existence of *Pseudopsolus macquariensis* at Stewart Island and *Cucumaria brevidentis,* var. *carnleyensis* at Macquarie Island is easily explained as being due to transport on floating algæ. Benham, it is true, has thrown doubt on the possibility of such transport. "Any one who has had experience of the size and tremendous power of the waves in these southern latitudes, and of the terrific windstorms that constantly rage over these seas, will be in a position to recognize the high degree of improbability that seaweed could be carried from island to island by the "West-wind trift" without being torn into fragments". (Report on the Oligochæta. Subantarct. Isl. of New Zealand. I. p. 294). I may object to this statement my own direct observations on various Echinoderms, a. o. Invertebrates,

being actually found, alive, among the roots of such algæ *(Macrocystis, Lessonia)* found floating in the sea or cast ashore *(Calvasterias Suteri, Ophiomyxa brevirima, Cucumaria leoninoides)*; it is quite probable that the leaves of these large algæ, when drifting in these exceedingly rough seas, will not stand a very long transport but be torn to pieces by the waves, as Benham suggests; but it is not on the leaves that the animals are living, but among or within the roots, and these are so tough and consistent that they will certainly stand a very long transport. The remarkable thing is not that various species of marine Invertebrates, which live among the algæ in the littoral region, are transported in this way from one island to another, but much more the fact that only so few species bear witness of having been transported in this way.

After all we must say that the information about the Echinoderm fauna of Macquarie Island which has been gained till now is in very good accordance with the oceanographical researches carried out by Sir Douglas Mawson, which tend to show that Macquarie Island is separated from the New Zealand Plateau by a wide area of very deep water, and that the island has never, at least since Mesozoic times, formed part of the New Zealand continental area.

As regards the relation between Macquarie Island and the Magellanic region, as shown through the existence in both of *Sporasterias antarctica* and the genus *Cycethra*, a former direct connection is not necessarily proved thereby, as both forms may well have been transported on floating algæ, both being littoral and living among algæ.

The Echinoderm fauna of the Chatham Islands is very insufficiently known. So far as I have been able to gather from literature, only the following 8 species have been recorded form there:

Ophionereis fasciata[1])	Henricia compacta
Pectinura cylindrica	Allostichaster polyplax
— maculata	Cucumaria brevidentis
Goniaster pulchellus	Chiridota gigas

Excepting *Chiridota gigas*, of which only one specimen has as yet been recorded from the New Zealand coast, all are common

1) This species needs reexamination; it is recorded as *Ophionereis Schayeri*, but probably is *O. fasciata.*

New Zealand species. The Echinoderm fauna of the Chatham Islands thus appears to be identical with that of New Zealand, though perhaps not fully so rich. But a more careful investigation of the marine fauna of the Chatham islands would be very desirable.

The littoral fauna of the Kermadec Islands is fairly well known through the collections made by Mr. W. R. B. Oliver, treated by Benham.[1]) It appears very clearly from these reports that the Echinoderm fauna of this small group of islands is very different from that of New Zealand, its character being much more tropical. It seems evident that this climatic difference is too great for most species to stand it. The following 7 species are common to the Kermadecs and New Zealand:

Heliocidaris tuberculata	Ophionereis fasciata[2])
Echinocyamus polyporus	Astropecten polyacanthus
Ophiothrix Oliveri	Ophidiaster kermadecensis
Amphipholis squamata	

Three of these, *Echinocyamus polyporus*, *Ophiothrix oliveri* and *Ophidiaster kermadecensis*, are not known to occur outside the New Zealand region and therefore indicate that the Kermadecs belong really to the New Zealand region and that the different character of their Echinoderm fauna is due mainly to their different climatic conditions.

Geographically also Lord Howe Island and Norfolk Island may be reckoned to the New Zealand region, but, still more than with the Kermadecs, their climatic conditions forbid any nearer relation between their littoral faunas of Echinoderms. While Norfolk Island is almost totally unknown as regards its Echinoderm fauna, that of Lord Howe Island is fairly well known. A list of its Echinoderms is given by H. L. Clark.[3]) It has two species in common with New Zealand, viz. *Coscinasterias*

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[1]) W. B. Benham. Stellerids and Echinids from the Kermadec Islands; Report on Sundry Invertebrates from the Kermadec Islands. (Trans. N. Z. Inst. XLIII—XLIV. 1910—11).

[2]) Recorded as *Ophionereis Schayeri*, but may well be *O. fasciata*. Reexamination necessary.

[3]) H. L. Clark. Echinodermata. Trawling Expedition of the "Thetis". Mem. Austral Mus. IV. 1909. p. 520.

calamaria and *Heliocidaris tuberculatus,* both widely distributed species which are of very little zoogeographical importance.

Turning now to the relation between the Echinoderm fauna of the New Zealand region as a whole with that of other regions, Australia, as might be expected, stands foremost, 1 9 species — or 16 % — of the 119 species known from New Zealand being common to New Zealand and Australia. These species are the following:

Aræosoma thetidis	Amphiocnida pilosa
Holopneustes inflatus	Amphipholis squamata
Heliocidaris tuberculata	Astropecten polyacanthus
Clypeaster virescens	Psilaster acuminatus
Laganum depressum	Allostichaster polyplax
Echinocardium australe	Coscinasterias calamaria
Ophiocreas constrictum	Stichopus mollis
Ophiothrix aristulata	Phyllophorus dearmatus
Ophiactis resiliens	Chiridota gigas
— hirta	

Leaving out of consideration such widespread forms as *Clypeaster virescens*, *Laganum depressum*, *Ophiothrix aristulata*, *Amphipholis squamata*, *Astropecten polyacanthus* and *Coscinasterias calamaria,* we still have a fair number of species left which bear testimony of a fairly close relation between the Australian and New Zealand Echinoderm faunas. They may be divided in two groups, deep-water and shallow-water species. To the former belong *Aræosoma thetidis, Ophiocreas constrictum, Ophiactis hirta* and *Psilaster acuminatus*; even though they are as yet known only from relatively small depths, it is very probable that they will prove to occur also in greater depths and to belong to the fauna of the deep-sea between New Zealand and Australia, and their occurrence in both areas, therefore, does not offer any zoogeographical difficulty. Very probably also several more of the species recorded from the deeper water off the North end of New Zealand likewise will prove to belong to a common Australian—New Zealand deep-sea fauna.

Regarding the littoral species most of them have pelagic larvæ, and their occurrence in both regions can, therefore, easily be explained through the transport of the larvæ across the not so very broad deep-sea area that now separates the two areas, a distance

which was, moreover, very considerably smaller during the time before the great subsidence of the New Zealand Plateau. This will easily account for the occurrence at New Zealand of such species as *Heliocidaris tuberculata*, *Echinocardium australe*, *Ophiactis resiliens* and *Stichopus mollis*, probably also *Chiridota gigas*. On the other hand, *Holopneustes inflatus* has certainly not pelagic larvæ; even if it can be maintained as separate from *H. purpurascens*, it is sure to have a shortened development like the latter.[1] The relatively large eggs of *Amphiocnida pilosa* indicate that this species has not pelagic larvæ either, and the same probably holds good for *Allostichaster polyplax* and *Phyllophorus dearmatus*. A passage of these forms across the deep-sea that now separates the two regions is hardly imaginable either in a pelagic stage or by means of transport on floating algæ, and even the raising of the northern extension of the great New Zealand Plateau would not make the direct transport across the separating sea very probable.

Holopneustes undoubtedly has its original home in Australia, but has extended its range to New Zealand; it forms an interesting parallel to *Pseudechinus*, which has, evidently, its home in the New Zealand region but has apparently extended its range to Australia, where it would appear to be represented by one species (cf. p. 399).[2] *Heliocidaris tuberculata* is doubtless also of Australian origin. As regards the other littoral-sublittoral species common to both regions it is, for the present, at least, hardly possible to form a definite opinion, whether they belong originally to the Australian or the New Zealand region.

It is worth emphasizing that two species which were hitherto regarded as common to Australia and New Zealand, viz. *Ophionereis Schayeri* and *Ophiomyxa australis*, are not really so, the New Zealand forms representing two well defined species, *Ophionereis fasciata*

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1) Th. Mortensen. Preliminary note on the remarkable shortened development of an Australian sea-urchin, Toxocidaris erythrogrammus. Proc. Linn. Soc. N. S. Wales. XL. 1915. p. 206.

2) It is worth recalling in this connection that the species *Amblypneustes pachistus* H. L. Clark (Hawaiian a. o. Pacific Echini. The Pedinidæ etc. Mem. Mus. C. Z. XXXIV. 1912, p. 327) was founded partly on specimens labelled New Zealand. Clark himself regards this as incorrect labelling, the species being known with certainty only from Westernport, Australia.

and *Ophiomyxa brevirima*, known to occur only in the New Zealand region. The genera *Ophionereis* and *Ophiomyxa* being very widely distributed, these two species are of no importance for indicating zoogeographical relations between New Zealand and other regions (Australia, S. Africa, S. America). On the other hand there are some other genera represented by nearly related species in New Zealand and Australia, viz. *Ophiocoma bollonsi—canaliculata, Nectria ocelligera—pedicelligera, Comanthus trichoptera—benhami.* These again bear important testimony of a former closer relation between the two regions.

This former closer connection between Australia and New Zealand indicated by the Echinoderm fauna of the two regions is easily explained through the Continental drift theory of Wegener, according to which New Zealand was originally directly connected with Australia, forming the Eastern border of the great Australian continental block, from which it was then separated through Australia drifting away from it.[1]) It is of very great interest that this hypothesis, which solves so many zoogeographical riddles in the most surprisingly clear way, thus gets support also from the study of the New Zealand Echinoderm fauna. At least it seems hardly possible to give any other satisfactory explanation of the correspondence of the New Zealand and the Australian Echinoderm faunas, unless the comparative study of the fossil Echinoderms of the two countries should give another natural explanation.

Professor H. L. Hawkins is at present engaged on an investigation of the Tertiary Echinoidea of New Zealand. His work has not been carried far as yet, but he has almost completed the study of the Regular forms. He has very kindly allowed me to publish the following note, laying emphasis on its provisional character:

Note.

Up to the present time the published accounts of the Fossil Echinoidea of New Zealand are almost worthless. The only exception is the description of five species given by Zittel in 1864 (Novara Exped., Geol. Teil., Bd. i, Abt. ii, pp. 62—66). The diagnoses given by Hutton in his Catalogue are useless without the

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1) Alfred Wegener. Die Entstehung der Continente und Ozeane. 3. Aufl. 1922. p. 46.

specimens, and a large proportion of the type specimens are useless anyway. Tate's attempted comparison between the New Zealand and Australian fossils seems to have been almost disastrous [1]).

Except for a series of Cidaroid radioles (including forms probably belonging to *Goniocidaris* and perhaps to *Phyllacanthus)* and the two living species *Notechinus novae-zealandiae* and *Pseudechinus albocinctus* (these are from raised beaches of probable Pleistocene age), practically all the known Tertiary forms seem to come from the older systems, chiefly the Miocene. This is probably the explanation of the extreme disproportion between the Regular and Irregular forms, the latter predominating enormously in numbers and variety. Such disproportion seems a normal feature of early Tertiary Echinoid faunas throughout the world.

Of the Cidaridae, Hutton's "*Cidaris*" *striata* has nothing to do with Duncan's "*Leiocidaris*" *australiae*, but seems to be more akin to *Goniocidaris* or to some Cretaceous group such as *Typocidaris.* It is probably of Miocene age, and can be compared closely only with the series of so-called *Goniocidaris* from the Miocene of Kutch described by Duncan & Sladen in 1883 (Pal. Indica, ser. xiv, vol. i, part iv). Another Cidarid, of proportions dwarfing those of *Phyllacanthus imperialis*, occurs in some abundance in deposits that are probably of Miocene date. Its generic position is doubtful, but I know of no species with which it can be compared at all closely.

The non-Cidarid Regular forms from the older Tertiary are mostly very small, and seem all to be akin to the troublesome *Paradoxechinus*-group well-known in Australia. Most of them have sculptured tests; and they show a remarkable uniformity of "mode" in spite of generic differences. "*Echinus*" *enysi* Hutton (which is utterly unlike "*Psammechinus*" *woodsi* from Australia) seems certainly to belong to *Grammechinus*, a monotypic genus from the Miocene of Northern India.

Among the Irregular genera, which I have not yet studied in detail, it is possible to record *Fibularia* and *Arachnoides.* There is

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[1]) R. Tate. Critical list of the Tertiary Mollusca and Echinodermata of New Zealand in the Collection of the Colonial Museum, in Reports of Geological Explorations during 1892—93. Colonial Museum and Geol. Surv. of New Zealand. Nr. 22. 1894.

Zittel's "*Nucleolites*" *papillosus* which may prove to be a forerunner of *Apatopygus.* I have not seen an undoubted example of "*Lovenia*" *forbesi* from New Zealand, but there are one or two closely allied forms. Of the Spatangidae, all I can say at present is that the genera indicated by Hutton need reconsideration, while most of his species are based on hopelessly imperfect material. There is, however, a large series of better specimens now available; and it is obvious that the two species of the family now living in the area are relics of a far more comprehensive fauna.

H. L. Hawkins.

It is, of course, too early to draw any conclusions as regards the former interrelation between the New Zealand and the Australian Echinoderm faunas from the preliminary informations given by Prof. Hawkins in the above note, the more so as also the Australian fossil Echinoderm fauna stands greatly in need of a complete revision.

I beg to thank Professor Hawkins most cordially for his kindness in allowing me to include the above most interesting note in my report.

A most interesting problem is the relation of the New Zealand Echinoderm fauna to that of the Antarctic and Subantarctic region, especially the Magellanic region. As seen from the list of the New Zealand Echinoderms given above only two species are known with certainty to be common to the New Zealand and the Magellanic region, viz. *Amphiura magellanica* and *Cucumaria calcarea;* very probably also *Gorgonocephalus chilensis* will ultimately be found to be common to both regions, the New Zealand form being only provisionally regarded as a separate variety. Several more species have been maintained to be common to the two regions, e. g. *Notechinus magellanicus, Echinus margaritaceus, Ophionereis Schayeri, Odontaster Grayi, Caudina chilensis, Cucumaria brevidentis, Cuc. leonina*; but these are all erroneous identifications, as has been shown in the present and the two previous reports on the New Zealand Echinoderms. The two (three) above named species have come instead of the old, erroneous cases to show that there is some slight relation between the New Zealand and the

Magellanic Echinoderm faunas. To these must also be added some few cases of nearly related species occurring in the two regions, viz. *Notechinus novæ-zealandiæ—magellanicus, Amphioplus basilicus —textilis, Allostichaster insignis—æqualis, Amphiura eugeniæ* — var. *latisquama.*

If we regard more closely into the matter, we find that, excepting *Gorgonocephalus chilensis,* all the identical or nearly related species occurring in the two regions live in the littoral region and are thus very liable to be carried along in the roots of large floating algæ. *Gorgonocephalus chilensis* is not known to occur in the littoral region and therefore a transport on floating algæ cannot explain its occurrence both in the Magellanic region and at New Zealand; but it may well be assumed to have free swimming larvæ, which would easily account for its occurrence in both regions, the more so at it is known also from Kerguelen.

Thus, we need not have recourse to any former land or shallow water connection between New Zealand and S. America (Patagonia) in order to explain the similarity in their Echinoderm faunas. It may rather be maintained, on the contrary, that the Echinoderm faunas of the two regions bear witness against such former connection in post-mesozoic times. If such had existed, it should be expected that the *Ophionotus-* and the *Abatus*-group, so highly characteristic of the Magellanic region, would be represented also in New Zealand, especially at the Auckland-Campbell Islands. But this they are, evidently, not; otherwise I could hardly have failed to discover them there in the several dredgings which I undertook, especially with the object of ascertaining their existence or non-existence there. Both these forms belong to the deeper littoral, and a transport over the open sea on floating algæ evidently is out of question; moreover they are viviparous (excepting *Ophionotus victoriæ).* They are, therefore, of the highest zoogeographical importance, their occurrence in distant localities (e. g. S. America and Kerguelen) giving strong evidence of former direct connection between such localities. As both types are widely distributed in the Antarctic and Subantarctic regions, the conclusion seems justified that, if there had been a former land-connection between the Auckland-Campbell Islands and the Magellanic region, or with Antarctica, one should expect to find both

these types there. Their absence at the Auckland-Campbell Islands shows that, if there has been a direct connection between the two regions — as is indicated by so very many facts in the distribution of both plants and animals of these regions, and as is also maintained by the Wegener-theory — such connection must have been discontinued, before the said forms came into existence, that is to say — for the *Abatus*-group — probably in the early Tertiary.[1])

It is of interest to note in this connection that P. Marshall in his paper on the Geology of Campbell Island and the Snares (Subantarct. Isl. of New Zealand II) mentions a *Micraster* and a *Brissopsis* as occurring in a limestone at Perseverance Harbour, Campbell Isl., of early Tertiary age. Unfortunatety, the uncertain identification, together with the fact that no figures are given of these fossils, does not allow to draw definite conclusions as to the relation of these fossil Echinoids from the Campbell Island to those of the Magellanic region. But if the identification of these forms as belonging to *Micraster* and *Brissopsis* is correct, this proves that also the fossils are quite different from those of Patagonia.

A comparison again of the New Zealand Echinoderm fauna with that of the Antarctic most decidedly shows that there is no relation whatever between these two faunas. Alone the genus *Ophioceres* is, so far as we know, restricted to these two regions, one species, *O. incipiens*, being known from the Antarctic, the other, *O. Huttoni*, from New Zealand. I cannot give any satisfactory explanation of this fact; but, in any case, we cannot see herein any proof whatever of a former nearer connection between the two regions — we might equally well maintain that the existence of the genus *Ophiopteris* alone in New Zealand and California proves a direct connection to have existed between those two countries

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1) We do not know the exact time, when the *Abatus*-group came into existence. But I would suggest that the *Schizaster patagonensis* of Lambert (Note sur les Échinides recueillis par M. A. Tournouër en Patagonie. Bull. Soc. Géol. de France. 4. Sér. III. 1903. p. 481, Pl. XV) really belongs to this group. Lambert is of opinion that the strata from which the said collection of fossils came are of oligocene or miocene age. — Cf. also the author's report on the Echinoidea of the German S. Polar Expedition (Deutsche Süd-Polar Expedition XI. Zoologie III. 1909. p. 101). — As regards the time, when the *Ophionotus*-forms came into existence we have no means of forming any opinion thereof.

or that the genus *Stegnaster*, known only from New Zealand and the West Indies, proves a direct connection between these two regions to have existed in previous times. And here again the absence of the *Abatus*-group in New Zealand bears testimony against a former connection with Antarctica, where it is just as wide spread as in the Subantarctic region (Patagonia, Kerguelen).

The comparison of the Echinoderm fauna of the New Zealand region with that of the Magellanic and the Antarctic region thus gives the result that the few cases of identical or nearly related forms occurring in the two regions do not afford sufficient testimony for a former direct connection between the two areas, while the absence in the New Zealand region of the highly characteristc subantarctic and antarctic *Abatus*-group decidedly bears testimony against such connection in post-mesozoic times.

It is still to be pointed out that there is no relation either between the Echinoderm fauna of New Zealand and that of South Africa. A few species have been stated to be common to these two regions: *Echinus angulosus*, *Henricia ornata*, *Ophiomyxa australis;* but these are all erroneous identifications. Some other species which really occur in both areas, like *Astropecten polyacanthus* and *Coscinasterias calamaria*, are widely distributed forms which do not mean anything for proving a nearer relation between the two faunas.

It is thus evident from a study of the zoogeographical relations of the New Zealand Echinoderm fauna that the only other fauna to which it has really any nearer relaton is the Australian. To the Antarctic fauna or the Magellanic fauna it has no closer relation. Further it is evident that, as regards their Echinoderm fauna, the Auckland-Campbell Islands belong exclusively with New Zealand, this fauna being not at all subantarctic in its character, and the conclusion is obvious that the so-called "Subantarctic Islands of New Zealand" are not subantarctic at all.

The same result was reached already by Koehler in his fine study of the zoogeographical interrelations of the Echinoderm faunas of the various antarctic and subantarctic areas in his Report on the Echinoderms of the "Deuxième Expedition Antarctique Francaise (1908—1910)"; the more exact knowledge of the Echinoderm fauna of New Zealand and the Auckland-Campbell Islands now gained has fully borne out his result.

Second Appendix.

When, in the middle of September 1925, the last proofs of the above paper were in hand, notice was received from the Director of the Dominion Museum, Wellington, Dr. J. Allan Thomson, that recently a number of Echinoderms had been brought to the Museum by a local steam-trawler, the "Futurist", and that four species were being sent to me for examination. It was then thought preferable to have a note on this new material included in this paper, and the printing accordingly was stopped provisionally, until the said material could be at hand. On its arrival, in the middle of October, it turned out to represent an addition to the New Zealand Echinoderm Fauna of two new, very interesting species. It was thus well worth the little delay in the publication of the paper. The four species are:

Spatangus multispinus n. sp.
Persephonaster neozelanicus n. sp.
Psilaster acuminatus Sladen.
Astrotoma Waitei Benham.

The number of species of Echinoderms known from New Zealand is thus raised to 121, and the number of endemic forms to 100. The zoogeographical results arrived at above are not altered by the finding of the two new forms. The Spatangus has, so far as known hitherto, no relations nearer than the Hawaiian Islands or South Africa, while the new Asteroid has its nearest relations among forms known from the Philippine Sea.

No nearer information was included about locality and depth, where these specimens were found.

Spatangus multispinus n. sp.

Test 80 mm long, 76 mm wide, 40 mm high. General shape of the test broadly oval, scarcely asymmetrical; it is rather flattened, rising very gently to about midway between the apical system and the hind end. Frontal ambulacrum rather deep. — Petals narrow,

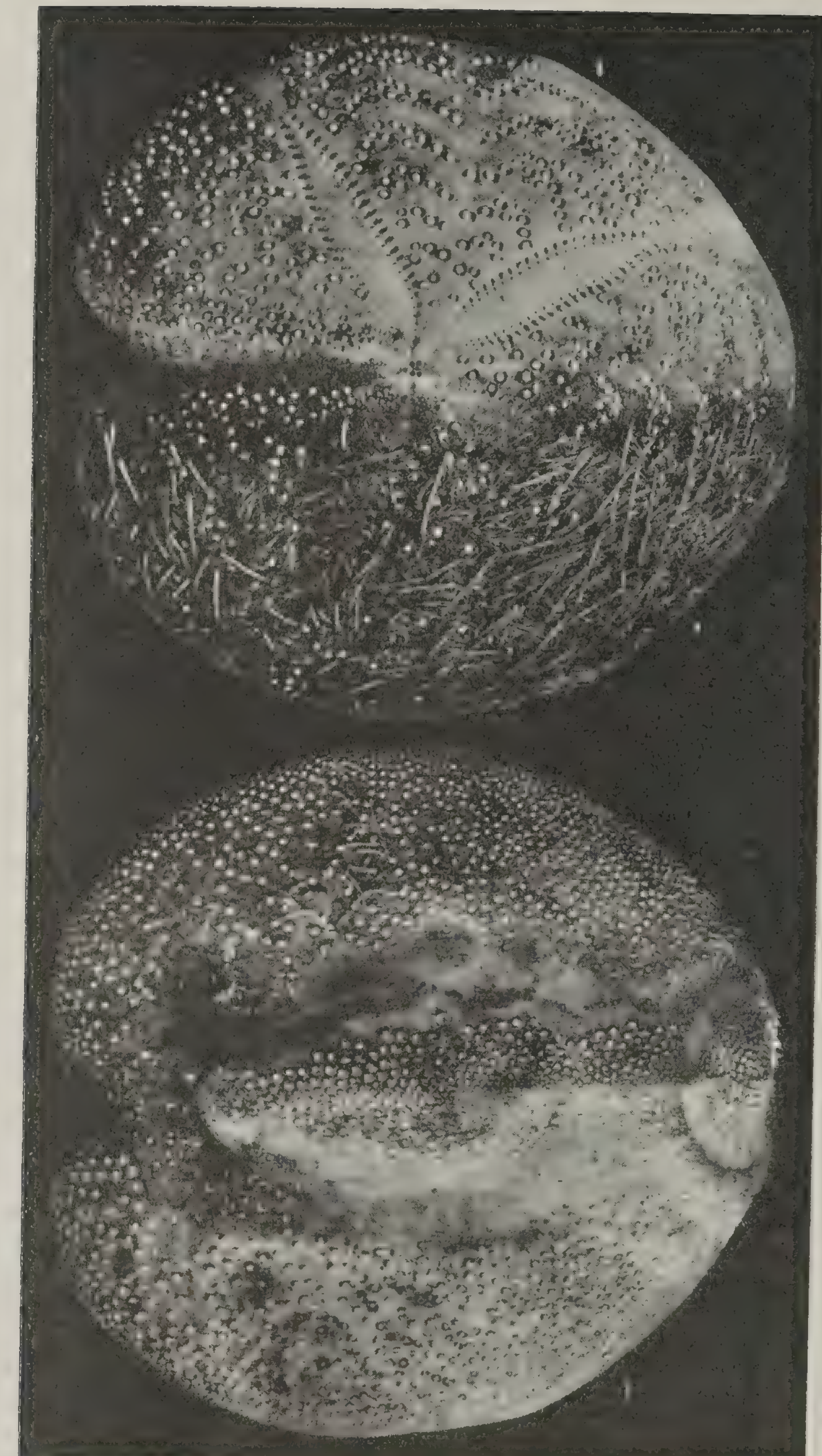


Fig. 68. *Spatangus multispinus* n. sp., from the oral and the dorsal side; slightly reduced.

distinctly tapering. Very numerous larger tubercles (and spines) in all the dorsal interambulacra, and also a few larger tubercles in the ambulacra outside the petals. Hind end of test vertical. Periproct transverse oval. Subanal plastron small, 20 mm wide, oval, mainly on the ventral side. 2 pairs of tubefeet enclosed by the fasciole. Plastron very narrow, the tubercles continuing without interruption on to the labrum, which is large and prominent. Pedicellariæ very scarce; only the two usual kinds of tridentate pedicellariæ have been found, viz. the slender and the short-valved, coarse form (Fig. 69. a, b). Colour purplish-violet.

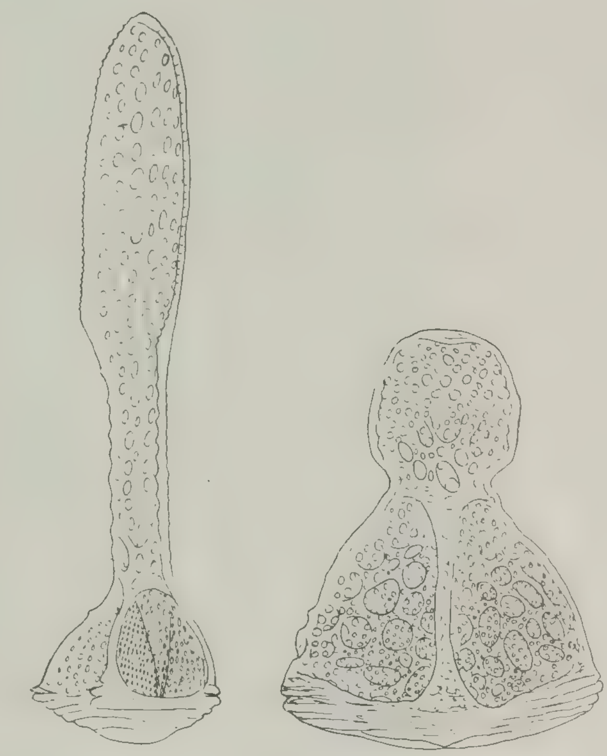


Fig. 69. Valves of tridentate pedicellariæ of *Spatangus multispinus*; a. slender; b. short-valved form. a. 115/1; b. 62/1.

This very distinct species appears to be the nearest related to the North Atlantic *Spatangus Raschi* Lovén, with which it agrees in the feature of larger tubercles occurring in the ambulacra, outside the petals. — As no species of the genus *Spatangus* is known to occur nearer than the Hawaiian Islands and the South African Seas, the finding of a species in New Zealand Seas is rather unexpected.

The type specimen in the Dominion Museum, Wellington.

Persephonaster neozelanicus n. sp.

Type-specimen measuring ca. 110 mm R, ca. 33 mm r, thus R = ca. 3.3 r. Arms ca. 35 mm broad at base, regularly tapering. In the second specimen the measurements are R ca. 103 mm, r ca. 27 mm, thus R = ca. 3.8 r. Arms ca. 29 mm broad at base. The second specimen thus has a rather smaller disk and more slender arms.

Paxillar area very broad; the paxillæ arranged in rather distinct transverse series, except along the midline, where no regular arrangement is seen; the size of the paxillæ very uniform, only slightly larger on the disk. The spinelets are slender, of equal length,

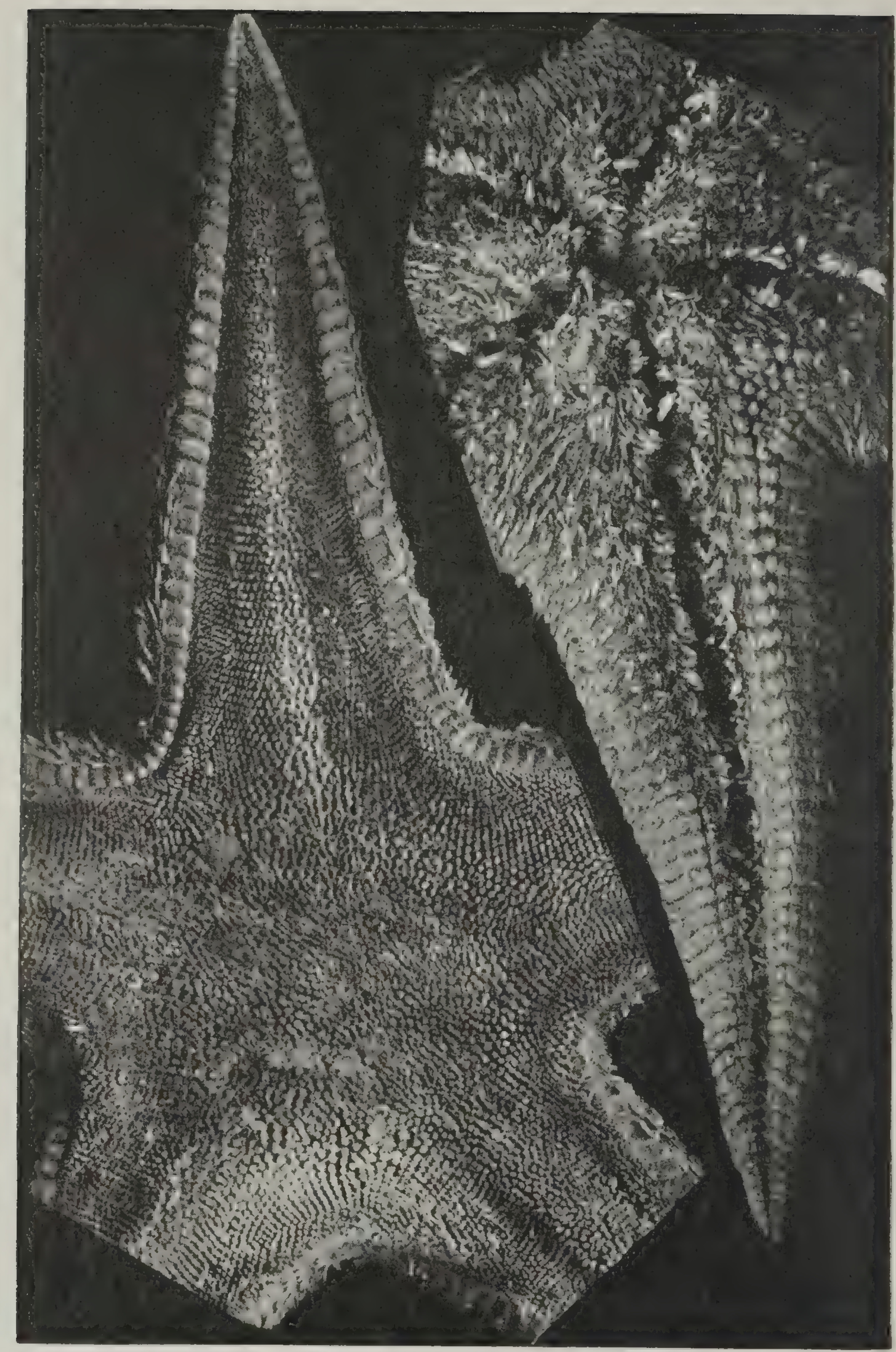


Fig. 70. *Persephonaster neozelanicus* n. sp. From the dorsal and oral side. Slightly reduced.

ca. 10—20 peripheral and ca. 6—8 central ones; apparently no pedicellariæ. The paxillar stalk rather slender; the plates are simple, elongate oval disks, not touching each other. — The madreporite fairly large, naked, nearer the edge than the centre of disk. No anal opening observable.

The marginal border not very high; the inferomarginals scarcely extend beyond the superomarginals, their aboral end scarcely at all tumid. Number of marginals 40 in both specimens. Superomarginals about twice as high as broad, not tumid, covered with a close coat of fine spinelets and besides bearing about in the middle a vertical series of 3—4, more rarely only two or as many as five large, slender, flattened spines, closely appressed and distalwards directed, reaching to the base of those of the following plate. In the second specimen these large superomarginal spines are fewer, only one to three, and are totally wanting on some of the proximal plates. In the outer part of the arms the superomarginals are somewhat oblique, the separating lines curving distinctly proximad. Inferomarginals in the type-specimen nearly four times as high as broad, in the second specimen somewhat less high; they are covered by short, flattened, rather scale-like spines, and bear along their distal edge a series of ca. 8 longer, flattened, appressed spines; the 3—4 upper ones are the longest, reaching somewhat beyond the base of those of the following plate. These longer upper spines form an oblique series towards the upper proximal corner of the plate, and they cover another series of 2—4 similar spines on the upper distal corner of the plate. The long spines on the upper end of the inferomarginals do not come into contact with those of the superomarginals.

Oral interradials at the base of arm in three series, the third series extending in the type along five, in the second specimen along three inferomarginals. The second series continues in the type specimen for ca. $^2/_3$ the length of the ray, in the second specimen scarcely to the middle. The first series in both continues almost to the end of the ray. — Adambulacrals with a comb of 6 rather large flattened spines, the middle ones turning edge to furrow. Subambulacral spines slender irregularly arranged in 3—4 longitudinal series. — The type specimen still shows a fairly pronounced reddish colour.

Type-specimen in the Dominion Museum, Wellington.

This species belongs to the *euryactis—luzonicus—anchistus* group of the genus *Persephonaster*, as comprised by Fisher. This group being otherwise known only from the Philippine Seas the discovery of a new species in New Zealand Seas is very interesting. — It seems to be the nearest related to *euryactis*, from which it is, however, well distinguished through the different form of the rays, the arrangement of the subambulacral spines etc. (cf. Fisher Starfishes of the Philippine Seas, p. 112).

It may perhaps be questionable, whether this group of species is justly referred to the genus *Persephonaster*; but this question cannot, of course, be discussed here.

Psilaster acuminatus Sladen.

The two specimens sent differ from those mentioned above (p. 274) in having somewhat slenderer arms and in the marginal plates being partly naked. There is some possibility that these specimens represent a second species, in which case there would be two species of the genus *Psilaster* in New Zealand Seas. This would account for the discrepancy pointed out above between the description and the figures of *Ps. acuminatus* given by Sladen. But it is equally well possible that the more or less naked condition of the marginal plates is a character subject to considerable variation in *Ps. acuminatus*. Only a rich material can give the proof whether the New Zealand Psilasters form one variable species or represent two distinct species.

The two specimens sent of *Astrotoma Waitei* Benham are perfectly typical and do not give rise to additional remarks.

N o t e ad p. 401. According to W. K. F i s h e r the genus *Parastichaster* of K o e h l e r is not to be distinguished from the genus *Sporasterias* Perrier; he also suggests that *Parastichaster Mawsoni* Koehler is probably the same as *Sporasterias spirabilis* (Bell.), from the Falkland Islands. As both are littoral forms living among the roots of the large algæ, the identity of the two forms would not mean any closer relation between the Macquarie Island and the Magellanic region, a transport by means of the algæ being sufficient explanation.

25—X—1925.

Explanation of Plates.

Plate XII.

Figs. 1—2. *Astropecten primigenius* n. sp.; 1. dorsal; 2. oral side.
— 3—4. — *dubiosus* n. sp.; 3. oral; 4. dorsal side.
— 5. *Luidia neozelanica* n. sp.; dorsal side.
— 6—10. *Pentagonaster pulchellus* Gray, various sizes; 8. oral side, the others from the dorsal side. Showing the various development of the subterminal marginal plates.
— 11. *Diplodontias dilatatus* (Perrier); dorsal side.
— 12—13. *Peridontaster Benhami* n. sp.; 12. dorsal; 13. oral side.
— 14—15. *Asterina (Asterinopsis) aucklandensis* Koehler. 14. oral; 15. dorsal side.
— 16. — *(Patiriella) regularis* Verrill. Specimen of perfectly pentagonal outline; dorsal side.
— 17. *Asterina (Patiriella) regularis*, var. *a.*; dorsal side.
— 18. — — — var. *b.*; — —

All figures natural size.

Plate XIII.

Figs. 1—2. *Henricia lukinsii* Farquhar. 1. oral, 2. dorsal side.
— 3—4. — *compacta*, var. *aucklandiæ* n. var. 3. oral, 4. dorsal side.
— 5—6. *Nectria pedicelligera* n. sp. 5. dorsal, 6. oral side.
— 7—8. *Asterodon miliaris* Gray. 7. dorsal, 8 oral side.
— 9—10. *Ophidiaster kermadecensis* Benham. 9. dorsal, 10 oral side.
— 11. *Stegnaster inflatus* (Hutton). Side view.
— 12. *Calvasterias lævigata* (Hutton). Specimen carrying its young on the mouth.
— 13—14. *Luidia varia* n. sp. 13. the disk, 14. two rays, from the dorsal and half from the oral side.

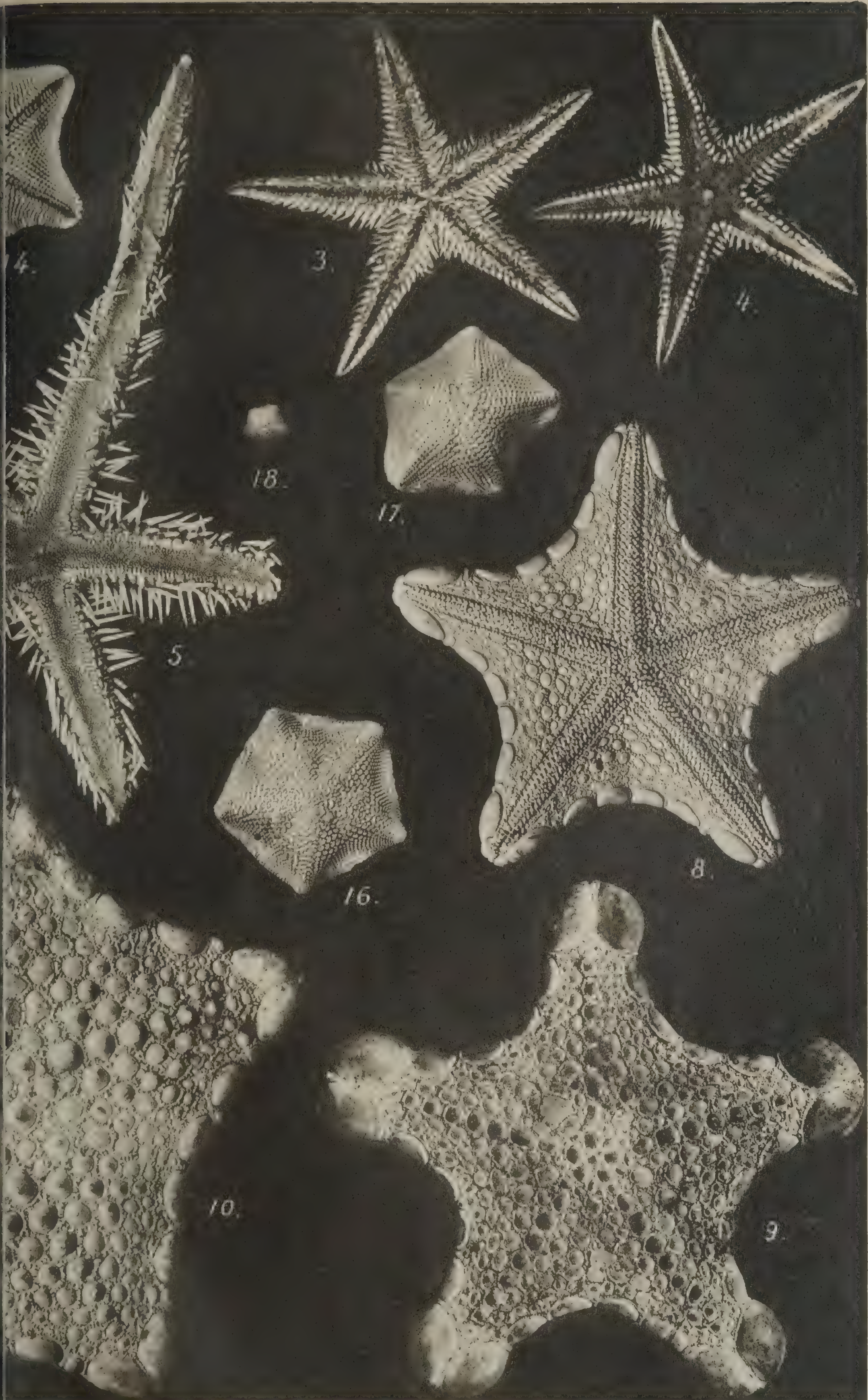
All figures natural size.

Plate XIV.

Figs. 1—2. *Stichaster australis* (Verrill). 1. dorsal, 2. oral side.
— 3—10. *Calvasterias lævigata* (Hutton); various sizes. Showing various development of dorsal spines. 5. a four-rayed specimen; 8—9. a very large specimen, from the dorsal and oral side.
— 11—12. *Astrostole scabra* (Hutton). 11. oral, 12. dorsal side.
— 13—14. *Sclerasterias mollis* (Hutton). 13. dorsal side, 14. an arm from the oral side.

All figures natural size.

V. Huth, phot.



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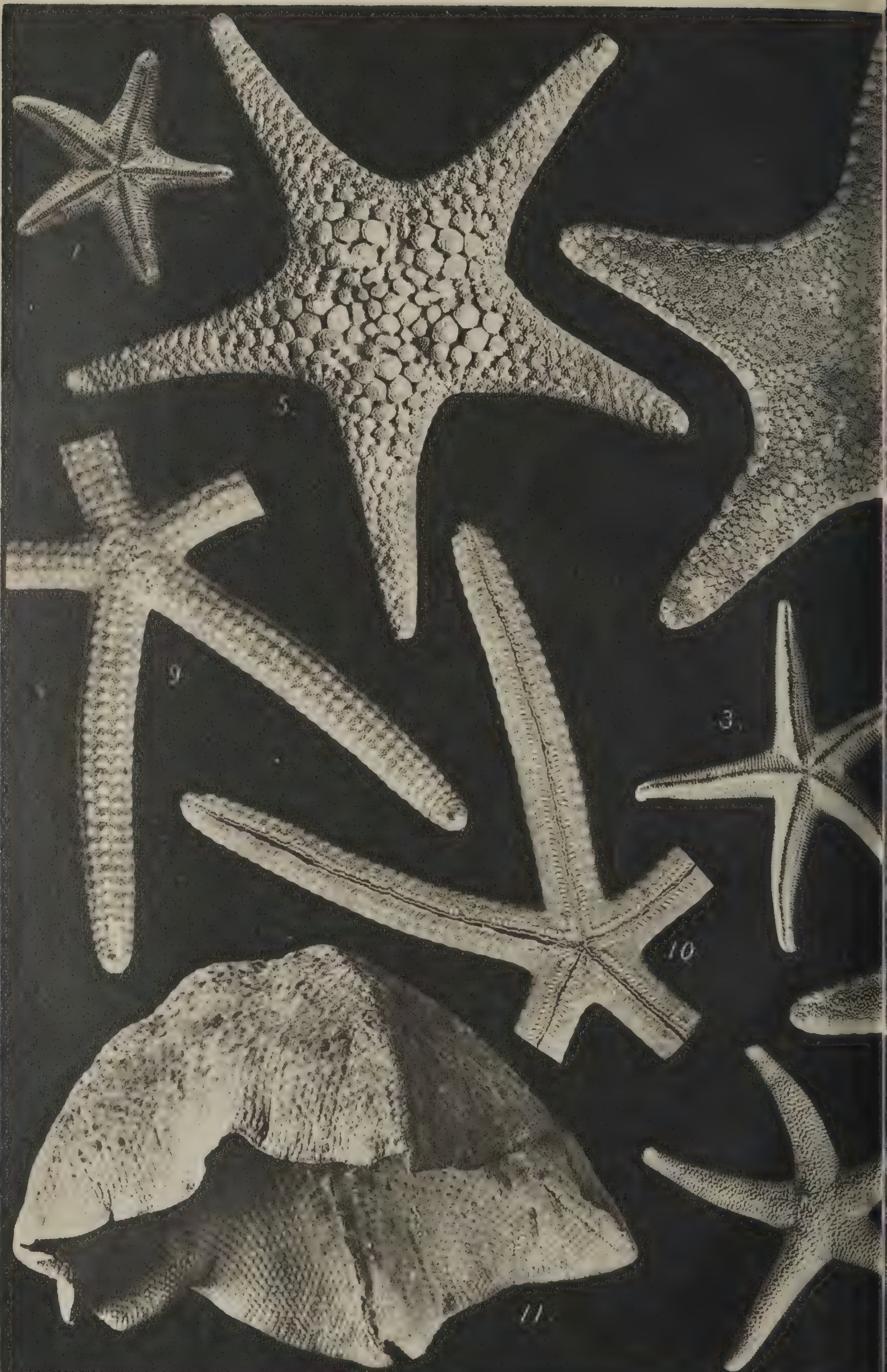

V. Huth, phot

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Videnskabelige Meddelelser

fra

Dansk naturhistorisk Forening i København

Bind 80.

Udgivne af Selskabets Bestyrelse.

Med 38 Tavler, 1 Kort og 132 Figurer i Teksten.

Ottende Aartis sjette Aargang. II.

København
I Kommission hos C. A. Reitzel.
1925.

Redaktionen af dette Bind er besørget af Professor, Dr. *Ad. S. Jensen.*

Andelsbogtrykkeriet i Odense.

Indhold.

R. S. Bergh,

Dr. phil.

22. September 1859—8. December 1924.

Af

R. H. Stamm.

Da Dr. phil. Rudolph Bergh for omtrent et Aarstid siden i Schweiz afgik ved Døden, havde han i saa lang Tid staaet helt uden for Zoologien og yderligere tilbragt saa mange af sine senere Aar i Udlandet, at han hos den yngre Slægt inden for Naturhistorikerne kun var kendt som et Navn; de Mennesker, som havde staaet ham nær, hans Venner og hans Elever, mindedes derimod med Vemod den rigt begavede, interessante og ualmindeligt indtagende Personlighed, som nu var gaaet bort.

Rudolph Sophus Bergh var født i Kjøbenhavn som Søn af Overlæge, Professor Rudolph Bergh og dennes Hustru Elisa-

beth, f. Simonsen. Begge Forældrene var højtbegavede Mennesker, hvis specielle Anlæg og Interesser paa en mærkelig Maade skulde genfindes hos, ja saa at sige strides om Overtaget hos Sønnen. Faderen var den videnskabelige Forsker, Lægen med det ansete Navn, der senere knyttedes til det af ham med saa stor Dygtighed ledede Hospital, og samtidig Zoologen, hvis om uhyre Flid vidnende anatomiske Arbejder, navnlig over de opisthobranche Snegle, skaffede ham Ry langt ud over Landets Grænser; dertil en Mand med Interesser og stor Viden paa Litteraturens og Kunstens Omraader. Moderen, hvis Forældre begge var ansatte ved det kongelige Theater, og som var Søster til Kammersanger N. J. Simonsen, var derimod stærkt musikinteresseret og elskede at samle om sig andre Musikdyrkere til Koncertaftener i Hjemmet; iøvrigt var hun en rolig og forstandig Dame og en udmærket Husmoder. I dette Hjem, hvor det aandelige Liv yderligere højnedes gennem de mange fremragende Personligheder, der her mødtes som Gæster, henlevede Sønnen, der var eneste Barn, sin Ungdom, fri for enhver økonomisk Bekymring. Kun 17 Aar gammel tog han Artium fra Metropolitanskolen og begyndte derefter at studere Medicin. Den Interesse for Zoologien, som allerede i Drengeaarene tydeligt var kommen til Syne — han havde saaledes, under Vejledning af Faderens Ven, O. A. L. Mørch, samlet ivrigt paa Konkylier—, gjorde sig imidlertid stærkere og stærkere gældende, og da de økonomiske Forhold ikke, som i sin Tid for Faderen, var nogen Hindring, opnaaede han let dennes Billigelse og rundhaandede Understøttelse til at følge sin Lyst. Fra sin Studietid mindedes han senere med Glæde saavel Jap. Steenstrup's interessante, men meget umethodiske Foredrag som Joh. Reinhardt's grundige og særdeles velformede Forelæsninger over Hvirveldyrene; om nogen stærkere Paavirkning fra disses Side er der dog ikke Tale; tidligt gik han sine egne Veje, idet han under Sommerophold, saaledes ved Hellebæk og ved Strib, gav sig af med selvstændige Studier over Havets mikroskopiske Organismer. Efter i 1882 at have taget Magisterkonferensen rejste han til Udlandet og tilbragte de følgende Aar, dels i Würzburg hos Faderens Ven, Professor C. Semper, dels paa den zoologiske Station i Villefranche sur mer. Førstnævnte Sted udførte han blandt andet den Undersøgelse over Hesteiglens Forvandling, som, efter hans Hjemkomst, 1885 skaffede ham Dok-

tortitlen. Efter dernæst i nogle Aar som Privatdocent at have holdt Forelæsninger og Øvelser ved Universitetet, fik han 1890 midlertidig Ansættelse som Docent i Histologi og Embryologi, en Stilling, han beklædte til Efteraaret 1903. Et særligt Laboratorium lykkedes det ham derimod ikke til en Begyndelse at faa; man forstod øjensynligt ikke Nødvendigheden af et saadant, som man tilmed befrygtede kunde blive en Rival til allerede bestaaende Institutioner. Ved velvillig Hjælp fra forskellig Side, saaledes fra Museumsinspector, Dr. Fr. Meinert og navnlig fra Professor, Dr. Eug. Warming, hvem han i den Anledning altid omtalte med dyb Taknemlighed, fik han dog snart baade Arbejdsplads og Mikroskoper til sine Kursus, der iøvrigt, noget senere, fik Husly paa Zoologisk Studiesal.

Firserne og den første Halvdel af Halvfemserne maa utvivlsomt betegnes som Bergh's lykkeligste Aar; han gik da med Liv og Lyst op i sin Universitetsgerning, skrev sine 2 Lærebøger og udgav endvidere et betydeligt Antal videnskabelige Arbejder. Mod Slutningen af dette Tidsrum indtræder imidlertid en Forandring; de fra Moderens Slægt arvede kunstneriske Anlæg, der i Mellemtiden ganske vist langtfra havde slumret, traadte nu mere og mere i Forgrunden, og hans videnskabelige Virksomhed kunde da afbrydes af Tidsrum, i hvilke han enten udelukkende var optaget af Musikken, eller hvor den Sindets Uro, der var en nødvendig Følge af de modstridende Interessers Kamp om Overherredømmet — en Uro, der yderligere forstærkedes ved Modgang i hans rent private Liv — affødte en saadan aandelig Depression, at han hverken kunde arbejde med det ene eller det andet. Forgæves søgte han at falde til Ro ved Rejser til Udlandet og navnlig ved Ophold i Neapel paa den zoologiske Station, hvis Forstander, Professor A. Dohrn, stod ham meget nær, og hvor han stadig traf gode Venner; i 1903 stod det ham ganske klart, at han maatte træffe et endeligt Valg mellem Videnskaben og Kunsten. Da den sidste, til hans Faders store Sorg og Mishag, gik af med Sejren, søgte han straks om sin Afsked og rejste kort efter til Tyskland, hvor han ihærdigt studerede Musik og Musikteori og samtidig komponerede adskilligt, dels Sange, dels større Musikværker. En lang Aarrække opholdt han og hans Hustru, Koncertsangerinden Fränzi Bergh, f. Tiecke, sig nu dels i Berlin, dels i Nærheden af Bonn; først efter Krigens

Ophør kom han tilbage til Danmark, hvor han efter nogen Tids Forløb havde den Glæde ikke blot at opnaa en Lærerstilling ved det kongelige Musik-Konservatorium, men ogsaa i 1922 at blive optaget i dettes Direktion. At denne Anerkendelse var velfortjent, er der ikke Grund til at betvivle; hans Kompositioner skal, efter kyndiges Udsagn, vidne baade om medfødt Begavelse og om højt udviklet, musikalsk Kultur, og hvad den videnskabelige Side af Musikken angaar, dyrkede han denne med lige saa stor Energi som i sin Tid Zoologien; hans Arbejde om „Musikken i det 19. Aarhundrede“ afgiver herom et tydeligt Vidnesbyrd.

Desværre skulde hans sidste Leveaar formørkes af Sygdom; en tuberkuløs og vistnok i Virkeligheden uhelbredelig Lidelse angreb først den ene Fod og nødvendiggjorde dennes Fjernelse og satte sig derefter fast i den venstre Underarm. Stærkt nedbrudt søgte han 1924 Helbredelse ved Kurstedet Davos i Schweiz, hvor hans Tilstand i Sommerens Løb tilsyneladende ogsaa bedredes saa meget, at han saa smaat tænkte paa at vende hjem; en hæftig Lungebetændelse gjorde det imidlertid i Løbet af kort Tid af med ham.

Allerede meget tidligt begyndte Bergh at optræde som videnskabelig Forfatter, og selv om de første Arbejder om „de athecate Hydroiders Histologi“, 1878, om „die erste Entwicklung des Eies von *Gonothyræa Lovéni*“, 1879, og om „Kløvning og Kimbladdannelse hos Echiniderne“, 1879, ikke giver saa særdeles meget nyt, er de dog interessante Prøver saavel paa hans Dygtighed som Undersøger som navnlig paa hans ualmindelig tidligt udviklede Evne til klart og kritisk at behandle den foreliggende Litteratur. Efter det lille Arbejde om Infusionsdyret „*Tiarina fusus*“, 1879, kom derpaa 1881 det af 5 Tavler ledsagede Værk „Der Organismus der Cilioflagellaten“, der, blandt hans øvrige specielle Arbejder udmærker sig ved at være det omfangsrigeste. Hos senere Forfattere har det høstet megen Anerkendelse; Bütschli siger saaledes i Bronn's Thier-Reich, i sin Bearbejdelse af Protozoerne, til hvilke Dinoflagellaterne dengang henførtes, at det ved sine Beskrivelser af flere nye Former og en skarpere Karakteristik af de ældre bidrog væsentligt til en bedre Forstaaelse af Forholdet mellem Slægter og Arter indbyrdes, samt endvidere, at hans System maa betegnes som et virkeligt Fremskridt. Denne sidste Bemærkning fortjener saa meget mere Opmærksomhed, som Afhandlingen just indtager

en Særstilling som en af de faa, der hovedsagelig er af systematisk Indhold. Ikke uden Interesse er dog samtidig de Ord „Eine phylogenetische Studie", som følger efter Afhandlingens Titel; de viser, at Bergh dengang, som iøvrigt hele Livet igennem, var en ivrig Tilhænger af Descendenslæren. Men, det maa her særligt betones, han var ikke en forblindet Tilhænger af denne; hans sunde, videnskabelige Taktfølelse holdt ham i Ligevægt, saaledes at han hverken fulgte Tanken paa alle dens Afveje eller lod sig forbløffe af de i det hele og store oftest ganske betydningsløse Indvendinger, der fra Tid til anden er bleven rejst mod den. I høj Grad betegnende for hans Standpunkt er det saaledes, at medens han ikke helt sjældent tillod sig kritiske Udfald imod Haeckel og navnlig visse af dennes Elever, nærede han alligevel samtidig en saadan Veneration for denne Mand og hans Livsgerning, at han, som han engang faa Aar før sin Død udtalte, havde følt det som en stor Tilfredsstillelse i 1912 at kunne være tilstede ved Indvielsen af det som et Monument for Haeckel tænkte phyletiske Museum i Jena.

Med Protozoerne, for hvilke Bergh stadig vedblev at nære stor Interesse, har han senere beskæftiget sig et Par Gange; iøvrigt kom han snart ind paa de Undersøgelser over Iglernes og Regnormenes Udvikling og finere Bygning, der ganske særligt blev hans Arbejdsfelt, og som fremfor alt skaffede ham et Navn blandt de zoologiske Forskere. Blandt disse Arbejder maa først og fremmest nævnes den med 4 Tavler illustrerede Disputats „Metamorphosen hos *Aulastoma gulo*", 1885, samt „Die Metamorphose von *Nephelis*", 1885, der hver især paa mange Punkter forøger eller uddyber Kendskabet til Kæbeiglernes Larveudvikling; saaledes beskrives heri blandt andet Dannelsen af Urnyrerne, Forekomsten af 2 særlige Hovedkim, der er Anlæggene til Dyrets forreste Parti, og som sammen med de tidligere kendte 2 Kropkim og den entodermale Midtertarm opbygger Dyrets blivende Legeme, Dannelsen af det definitive Svælg og af Endetarmen samt Afkastningen af den oprindelige Larvehud med dennes Muskulatur og Nervesystem. Som en Slags Fortsættelse slutter sig hertil de i 1890—91 udgivne: „Neue Beiträge zur Embryologie der Anneliden", i hvilke Kropkimenes Udvikling til den saakaldte Kimstribe og dennes Udformning til de forskellige Organer forfølges i Enkelthederne, dels hos Iglerne, dels hos Regnormene. Dette vanskelige Æmne, inden for

hvis Omraade Enighed blandt Forskerne synes saa svær at opnaa, vedblev stadig at fængsle Bergh; endnu i Foraaret 1903 var han til Tider stærkt optaget af Studier over „en Række forskellige Forhold“ ved Regnormenes Udvikling og tegnede dertil et stort Antal Figurer. At fuldende dette Arbejde syntes han en Tid at have tænkt paa; det blev dog ikke til noget, og han fremkom engang i den Anledning med omtrent følgende karakteristiske Udtalelse: „Er der virkelig noget nyt og rigtigt i mine Undersøgelser, bliver det nok før eller senere fundet af en anden; kan jeg derimod som Komponist skabe noget med et personligt Præg, vil ingen anden kunne gøre netop det samme.“

Blandt Afhandlingerne om Ormene henhører fremdeles „Untersuchungen über den Bau und die Entwicklung der Geschlechtsorgane der Regenwürmer“, 1886, adskillige mindre Arbejder over det, som det synes, ret omstridte Æmne, Segmentalorganernes Dannelse hos Regnormene, samt „Kleinere histologische Mittheilungen“, 1901, hvori en Række nye Oplysninger gives med Hensyn til den cytologiske Bygning af Iglelarverne og af Regnormenes Segmentalorganer.

Samtidig med disse Arbejder udkom dog ogsaa forskelligt paa andre Omraader, men dog altid vedrørende de hvirvelløse Dyr, saaledes 1888 Bemærkningerne om Udviklingen af *Lucernaria*, 1892—94 „Beiträge zur Embryologie der Crustaceen“, der behandler Mysidernes og Gammaridernes tidlige Udvikling, og hvori blandt andet de ejendommelige, regelmæssige Cellerækker beskrives, til hvilke han 1895 kom tilbage i det lille Arbejde „Ueber die relativen Theilungspotenzen einiger Embryonalzellen“; endelig 1898—1902 „Beiträge zur vergleichenden Histologie“, hvis Æmne er Blodkarrenes Bygning hos Molluskerne, Ormene og Arthropoderne, og som, til Trods for den Kritik, dets almindelige Resultater har mødt, utvivlsomt indeholder talrige gode Iagttagelser.

Alt i alt har Bergh, naar foreløbige Meddelelser ikke medregnes, udgivet omtrent 40 videnskabelige Afhandlinger[1]); i Omfang er disse gennemgaaende kun smaa, men til Gengæld virker de

[1]) En samlet Fortegnelse over disse findes i Svend Dahl: Bibliotheca zoologica danica 1876—1906, Kbhvn. 1910; glemt er heri dog de i dette Tidsskrifts Bind for 1879—80 udgivne „Bidrag til Opfattelsen af Kløvning og Kimbladdannelse hos Echiniderne“.

ved Læsningen næsten altid fængslende. Gang paa Gang maa man beundre den Klarhed, hvormed Problemerne er opstillede, den Omhu og tekniske Færdighed, hvormed Undersøgelsen er foretaget, og den fra al naturfilosofisk Dogmatik frigjorte Skarpsindighed, hvormed saavel de nye Fund som Forgængernes Resultater og theoretiske Overvejelser diskuteres og kritiseres. Kritik, for ikke at sige Polemik, finder man nemlig meget af i disse Arbejder, og, ligesom hos Faderen, fremsættes den ofte med bidende Vid og uden Personsanseelse. Alligevel skaffede han sig, mærkeligt nok, paa den Maade næppe mange personlige Fjender; som forskellige har meddelt mig, besejrede han endog sine Modstandere ved sit saa overordentlig vindende Væsen.

Berghs Universitetslærebøger, „Den almindelige Udviklingshistorie", 1887, og „Den dyriske Celle", 1892, der begge ogsaa foreligger i tysk og førstnævnte tillige i russisk Oversættelse, er gode Prøver paa hans klare Dømmekraft og lette Fremstillingsevne. Embryologien udmærker sig ved, at ogsaa Udviklingsprocesserne hos de hvirvelløse Dyr har fundet Omtale, og at der, i al Fald i den senere, tyske Udgave, ogsaa er taget Hensyn til Resultaterne af den som Entwicklungsmechanik betegnede Forskningsretning; samtidig kan man dog ikke undlade at give sin Tilslutning til W. Roux, naar denne udtaler det Haab, at Forfatteren i en ny Udgave ganske kort vil skildre i al Fald Hvirveldyrenes specielle Udviklingshistorie; Bogens Brugbarhed som Lærebog vilde derved unægtelig i høj Grad forøges. „Den dyriske Celle" er maaske nok mindre original i sit Anlæg, men har til Gengæld gjort fortræffelig Fyldest ved Undervisningen; som en klar og kortfattet, men samtidig hverken skematiseret eller ganske overfladisk Skildring af Histologiens Grundelementer staar den i Virkeligheden ogsaa selv nu uden Sidestykke.

Som Universitetslærer kom Bergh i sine gode Aar til at betyde overordentlig meget for de studerende; hans Forelæsninger fulgtes med megen Interesse, og hans praktiske Øvelser, hvorunder dengang foruden Histologien og Embryologien ogsaa Zootomien henhørte, saavel som hans Undervisning paa biologisk Kursus roses enstemmigt. Dette beroede utvivlsomt for en meget stor Del paa hans Personlighed; han havde en sjælden Evne til at komme i intim Forbindelse med sine Elever, til at vække disses Be-

gejstring for sit Fag og til i det hele taget at virke inspirerende; dertil kom, at han stod som Repræsentant for det nye inden for Videnskaben, for Mikroskopien, for Udviklingslæren samt for Arbejdet i Laboratoriet. At hans Nervøsitet i de senere Aar maatte sætte sig Spor ogsaa i denne hans Virksomhed er let forstaaeligt; mest gik det dog ud over Forelæsningerne, der kendeligt trættede ham, medens han derimod i det Laboratorium, han først 1897 havde opnaaet at faa grundlagt, stadig med Interesse tog sig af sine Elever.

I Dansk naturhistorisk Forening, af hvilken Bergh var Medlem fra 1876 til 1903, plejede han, navnlig i Firserne, som Foredragsholder at fremlægge Resultaterne af sine Undersøgelser; derimod har, utvivlsomt af Hensyn til de meget specielle Æmner, der absolut maatte gøre Publikationen i et udenlandsk Tidsskrift ønskelig, kun et Par enkelte og tilmed smaa Afhandlinger fundet Optagelse i Foreningens Meddelelser.

Lader man til Slut Blikket glide tilbage over Rudolph Berghs Liv og Livsgerning, kan man som Zoolog selvfølgelig kun beklage, at hans videnskabelige Løbebane saa forholdsvis tidligt blev afbrudt; paa den anden Side bør man dog huske, at han gennem sin Virksomhed i de Aar, da Forskningen fuldt optog ham, har skabt sig, baade som Videnskabsmand og Universitetslærer, et Navn, der med fuld Ret fortjener at erindres ogsaa i Fremtiden.

Carl Elberling.

Af

V. Nordmann.

Den 15. Juni 1925 mistede Naturhistorisk Forening sit daværende ældste Medlem, fhv. Bibliothekar Carl Elberling, der da afgik ved Døden i en Alder af 91 Aar og 2 Maaneder.

Carl August Elberling var Søn af Overlærer, senere Rektor C. W. Elberling og Hustru og fødtes i Slagelse 16. April 1834. Han blev Student 1851, studerede Naturvidenskaberne og tog 1859 Magistergraden i Naturhistorie med Mineralogi og Geognosi som Hovedfag. 1861—63 var han Assistent ved Mineralogisk Museum hos Forchhammer, men derefter knyttedes han til den Institution, som i hele Resten af hans Arbejdsaar skulde lægge Beslag paa ham, nemlig det store kongelige Bibliothek, hvor han virkede i 53 Aar. 1901 blev han Bibliotkekar, og 1915 tog han sin

Afsked. Om hans Virksomhed som Bibliothekar og Bibliophil skal her ikke tales, ligesaa lidt som om hans æstetisk-litterære Produktion; meget var det ikke, han publicerede, men dog mere, end han naaede at faa frem som naturhistorisk Forfatter. Som saadan er han nemlig kun kendt gennem to smaa Afhandlinger om Kalktuf, begge publicerede i dette Tidsskrift. Men den Interesse for Naturfagene, som han havde i sin Ungdom og som han bevarede hele Livet, gav sig dog Udslag paa forskellig Vis: dels blev hans Kendskab til den herhenhørende Litteratur af Betydning for Bibliotheket, dels stillede han den ogsaa til Raadighed for C. C. A. Gosch, da denne udarbejdede sit store Værk: Udsigt over Danmarks zoologiske Litteratur, dels kom hans Samling af naturvidenskabelige Værker og Afhandlinger andre til Gode, da han skænkede en større Samling Bøger til Fordeling blandt Medlemmerne af Dansk geologisk Forening, af hvilken han var Medlem fra dens Stiftelse i 1893 og til sin Død. Et andet Udslag af hans gamle Kærlighed til sit oprindelige Studiefag er meddelt af Museumsinspektør V. Hintze: i 1911, da Elberling tænkte paa at tage sin Afsked fra Bibliotheket, afgav han paany en Del af sin palæontologiske Samling til Museet, men beholdt dog en lille Kasse med Kildekalk-Forsteninger tilbage: „Dem ønsker jeg selv at bearbejde, naar jeg nu snart faar bedre Tid.“ Han var da 77 Aar gammel!

Om end Elberling af og til kunde vise sig i Foreningen (sidste Gang, han vides at have været tilstede ved et Møde, var ved 100-Aars Jubilæet for Jap. Steenstrups Fødsel), saa er det ganske sikkert meget længe siden, han hørte til de mere stadige Gæster ved Møderne, og selv de nuværende ældre Medlemmer kan derfor ikke ad den Vej have faaet noget personligt Kendskab til ham. Men de, der ret jævnlig færdedes paa det kgl. Bibliothek, navnlig før dets Overflytning til den nye Bygning, vil sikkert ofte have lagt Mærke til den lille, hvidhaarede Herre med det gammeldags Snit i sin Klædedragt, de forlængst umoderne „Fadermordere“ og det hvide Halsklæde, som han bar lige til det sidste.

Da det i 1924 var 70 Aar siden Elberlings Optagelse i Naturhistorisk Forening, sendte Bestyrelsen ham som Hilsen en Buket Blomster og en Adresse med Tak for hans Trofasthed gennem de mange Aar, en Opmærksomhed, for hvilken Elberling takkede i en egenhændig Skrivelse, der saavel fra Indholdets som

fra Formens Side vidnede om en usædvanlig aandelig Vivacitet hos en saa gammel Mand.

I 1854 blev stud. mag. Elberling Medlem af Naturhistorisk Forening, og paa Mødet den 14. November 1862 „meddeelte cand. magist. Elberling Resultaterne af sine Undersøgelser over nogle danske Kalktufdannelser i Henseende til deres geognostiske Forhold og de i dem indeholdte dyriske Levninger (forbeholdende sig senere at meddele sine endnu ikke afsluttede Undersøgelser over Plantelevningerne)“. Han fastslog her som et væsentligt Resultat, at disse Dannelser var *alluviale*. Efter Foredraget indledede Forchhammer en Diskussion (hvori Fogh og Hoff deltog) med Hensyn til Dannelsesmaaden af de i Kalktuffen forekommende Jern- og Manganlag; derefter fremsatte Jap. Steenstrup og O. Mørch Bemærkninger om Molluskerne.

Den lovede Meddelelse om Plantelevningerne i Kalktuffen gav Elberling paa Mødet den 9. November 1864 (samme Aar, som foranstaaende Fotografi er taget), men der skulde dog hengaa endnu 6 Aar, før Resultaterne af hans Undersøgelser blev publicerede. I „Videnskabelige Meddelelser fra den naturhistoriske Forening i Kjøbenhavn for Aaret 1870“ tryktes Elberlings første Afhandling: „Undersøgelser over nogle danske Kalktufdannelser“. Afhandlingen, der kun tæller 26 Sider og ledsages af to Tavler, var et Forsøg paa at besvare den af det kgl. danske Vid. Selsk. i Aaret 1868 udsatte Prisopgave, og den blev ogsaa tilkendt den udsatte Pris. I sin Indledning gør Forfatteren Rede for det daværende, temmelig mangelfulde Kendskab til disse Dannelser og deres Fauna og Flora og fortsætter derpaa: „Der hörer vistnok nogen Resignation til at undersöge en alluvial Dannelse i alle dens Enkeltheder; thi meget ofte vil man efter möisommelig Undersögelse komme til Resultater, der ingenlunde ere iöinefaldende. Det er derfor ikke saa underligt, at Geologerne i de Lande, der ere rige paa ældre Dannelser med deres mærkelige organiske Levninger, ikke anvende megen Möie paa Alluviet. Men Ingen kan forud vide, hvad heri kan findes og Ingen kan forud vide, hvad her kan hentes til Oplysning af Forholdene i de ældre Lag. Disse yngste Lag fortjene visselig en nöiagtig Undersögelse og Beskrivelse, og det har stedse forekommet mig som en Pligt for Geologerne i saadanne Lande som Danmark og Holland at udföre dette Arbejde“. — Selv kom

Elberling ikke til at yde ret meget paa dette Omraade, thi hans andet og sidste naturvidenskabelige Arbejde er en lille Artikel paa 4 Sider om en Kalktufdannelse ved Vejstrup Aa paa Fyn (publiceret i dette Tidsskrift for 1875—76), men dog er det neppe for meget sagt, at Elberling med disse to Smaaarbejder blev en af Banebryderne for Arbejdet just paa det Felt, Alluvialtidens Dannelser, hvor danske Forskere senere (og navnlig i de sidste 30 Aar) har gjort en meget betydelig Indsats.

Oversigt

over

de videnskabelige Møder

i

Dansk naturhistorisk Forening

fra 1. April 1924 til 31. Marts 1925.

Den 4. April 1924. Lektor **M. Thomsen** gav en Meddelelse om de paa vore Æbletræer levende Bladlus-Arter og deres Biologi.

Diskussion: Overretssagf. Gudmann.

Stud. mag. **A. Hemmingsen** gav en Meddelelse om Blodsukker og Insulinvirkning hos lavere Dyr. (Trykt i Skandinavisches Archiv für Physiologie, Bd. XLV og XLVI).

Diskussion: Prof. Krogh.

Den 2. Maj 1924. Kommunelærer **E. Nielsen** gav en Meddelelse om *Agalena labyrintica:* dens Net og Retræte, dens Sædspind og Parring samt Omsorg for Æggene.

Dr. phil. **R. Ege** gav en Meddelelse om Osmose og Permeabilitet. (Se Nordisk Hygieinisk Tidsskrift, Bd. 5, 1924, S. 207).

Diskussion: Dr. N. R. Jørgensen.

Den 10. Oktober 1924. Cand. mag. **K. Stephensen** gav en Meddelelse om en for Fauna'en ny Corophium-Art og dens Biologi samt om en indo-pacifisk Land-Amfipod i Drivhuse i København. (Se Vidensk. Medd. fra Dansk naturh. Foren. Bd. 78, 1924, S. 69 og S. 197).

Diskussion: Mag. sc. P. Kramp.

Cand. mag. **M. Degerbøl** berettede om Muldvarpens Vandring gennem Skodborg og Vandfuld Herreder. (Se Vidensk. Medd. fra Dansk naturh. Foren., Bd. 78, 1924, S. 201).

Den 24. Oktober 1924. Stud. mag. **Erik M. Poulsen** foredrog en økologisk-dyregeografisk Undersøgelse: Islandske Ferskvandsentomostraker. (Se Vidensk. Medd. fra Dansk naturh. Foren., Bd. 78, 1924, S. 81).

Diskussion: Dr. Blegvad.

Den 7. November 1924. Dr. phil. **N. Blegvad** talte om *Diastylis Rathkei*'s Biologi.

Diskussion: Dr. Th. Mortensen, Cand. mag. K. Stephensen, Mag. Spärck og Prof. Ad. Jensen.

Mag. scient. **P. Jespersen** talte om Fuglelivet paa Atlanterhavet. (Se „Naturens Verden", 9. Aargang, 1925, S. 337).

Den 21. November 1924. Mag. sc. **O. Hagerup** holdt et af Lysbilleder ledsaget Foredrag om sine Iagttagelser over Fugle og Pattedyr paa Færøerne og paa en Rejse til og fra Færøerne.

Diskussion: Cand. mag. Degerbøl, Dr. Th. Mortensen, Prof. Lindhard, Mag. Tåning og Prof. Ad. Jensen.

Den 5. December 1924. Mag. sc. **P. Kramp** holdt et af Lysbilleder ledsaget Foredrag om biologiske Dykkerundersøgelser ved Hanstholm. (Se „Naturens Verden", 9. Aargang, 1925, S. 62).

Diskussion: Ingeniør Fibiger, Dr. Blegvad, Stud. mag. Heding, Dr. V. Nordmann, Prof. Ad. Jensen.

Den 16. Januar 1925. Direktør, Dr. phil. **C. G. Joh. Petersen** gav en Meddelelse om, hvorledes Hvalerne bærer sig ad med at svømme. (Trykt i Det Kgl. D. Vidensk. Selsk. Biol. Medd. V, 2, 1925).

Diskussion: Cand. phil. P. Freuchen.

Statsgeolog, Dr. phil. **V. Nordmann** foreviste nogle bævergnavede Pinde fra en ny interglacial Mose ved Højer og knyttede dertil nogle Bemærkninger om Lejringsforholdene. (Se Vidensk. Medd. fra Dansk naturh. Foren., Bd. 78, 1924, S. 209).

Den 30. Januar 1925. Ornitholog **E. Lehn Schiøler** holdt Foredrag om det ny Jagtlovsforslag og dets Betydning for vor Fugleverden.

Diskussion: Lektor Ferdinand, Prof. Wesenberg-Lund, Læge Krabbe, Lektor Thomsen, Docent Stamm, Konservator Manniche.

Som Resultat af Mødet nedsattes et Udvalg: Lektor Ferdinand, Mag. sc. P. Jespersen, Mag. sc. R. Hørring og Prof. Wesenberg Lund, der skulde se at faa Forbindelse med andre interesserede Foreninger og sammen med dem søge Forhandling med Regering og Rigsdag for at opnaa Ændringer i det ny Forslag til Jagtlov.

Den 13. Februar 1925. Dr. phil. **Th. Mortensen** gav følgende Meddelelse: Antarktisk-zoogeografiske Studier. (Med Lysbilleder). (Se Vidensk. Medd. fra Dansk naturh. Foren., Bd. 79, 1925, S. 393).

Mag. sc. **R. Spärck** gav en Meddelelse om de recente og fossile Østersforekomster i Danmark sammenlignet med Hollands og Sydvestfrankrigs. (Se Beretning fra Den danske Biologiske Station, XXI, 1925, S. 59).

Diskussion: Dr. phil. C. G. Johs. Petersen, Dr. Blegvad, Statsgeolog A. Jessen, Mag. sc. P. Kramp.

Den 27. Februar 1925. Dr. phil. **A. C. Johansen** holdt Foredrag om Vekslingerne i Fauna'en og Fiskerierne i Kattegat og Belthavet fremkaldt ved Forandringer i Vandcirkulationen. (Se Medd. fra Kommissionen for Havundersøgelser, Serie Fiskeri, Bd. VII, Nr. 8, 1925).

Diskussion: Dr. Blegvad, Prof. Martin Knudsen, Mag. sc. Kramp.

Stud. mag. **A. Bruun** gav en Meddelelse om Dværgulkens *(Cottus Lilljeborgi)* Udbredelse og Larveform. (Trykt i Publications de Circonstance No. 88, 1925).

Diskussion: Mag. Tåning, Prof. Ad. Jensen.

Den 13. Marts 1925. Dr. phil. **R. Ege** holdt Foredrag om Temperaturens og Surhedsgradens Indflydelse paa Enzymer. (Se Zeitschrift für physiologische Chemie, Bd. 143, 1925, S. 151).

Kommunelærer **E. Nielsen** gav en Meddelelse om Edderkoppernes Kløer og Bikløer, et Forsøg paa at gøre Rede for, hvorledes Spindetraadene let gribes, fastholdes og atter slippes.

Diskussion: Cand. mag. Brændegaard.

Den 27. Marts 1925. Mag. sc. **O. Hagerup** foreviste i Lysbilleder en Række interessante Dyreformer efter Fotografier, optagne af ham selv paa Sumatra, og knyttede dertil Bemærkninger om disse Dyrs Biologi.

Til dette Møde var Medlemmernes Damer indbudt.

Beretning om de i Aarene 1924 og 1925 af Dansk naturhistorisk Forening foretagne Ekskursioner.

Den 17. Maj 1924. Besøg i Zoologisk Have under Ledelse af Direktør **W. Dreyer.**

Af Foreningens Medlemmer deltog 34, som samledes ved Apistemplet Kl. $10^1/_2$, hvor de modtoges af Direktør Dreyer, der derefter førte Deltagerne rundt i Haven og fortalte instruktivt og fornøjeligt om de forskellige Arter.

M. Th.

Den 1. Juni 1924. Ornithologisk Ekskursion til Holteegnen under Ledelse af Kontorchef **A. Koefoed.**

Deltagernes Antal var 25. Man samledes paa Holte Station og spaserede først til Lederens Villa, i hvis Have en rugende broget Fluesnapper i en Redekasse blev forevist. Fuglen lod sig ingenlunde forstyrre af, at samtlige Deltagere efterhaanden kiggede ned til den. Derfra gik Turen til Kollemose, hvor den interessanteste Begivenhed var en Graagaas paa Reden. Efter et Besøg i Læge Schæffer's Have, hvor særlig Redekasser betragtedes, fortsattes til Frederikslund Skov og Rudersdal. Paa Kroen holdtes Frokosthvil, og man gik derefter ind i Rude Skov; her blev dog Udbyttet kun ringe, idet det begyndte at regne, og da det saa ud til at blive Dagsregn, afsluttedes Ekskursionen. Det mindre gode Vejr gjorde overhovedet, at der ikke blev set saa mange Arter som ventet. Der fandtes:

Jærnbanestien: *Sylvia atricapilla* (med Rede og 4 Æg). — Lederens Have: *Muscicapa atricapilla* (med Rede og 6 Æg). — Kollemose: *Anser cinereus* (paa Reden), *Fulica atra, Gallinula chloropus, Luscinia philomela* (Rede med 5 brune Æg), *Praticola rubetra, Sylvia hortensis, Acrocephalus arundinaceus, A. phragmitis, Parus major, Alauda arvensis, Cannabina linota, Ligurinus chloris, Emberiza schoeniclus, Fringilla coelebs, Passer domesticus, Pica caudata, Hirundo riparia, H. rustica. Cypselus apus.* — Læge Schæffer's Have: *Iynx torquilla*'s Rede. — Frederikslund Skov: *Anas boschas,*

Podicipes cristatus, Fulica atra, Columba palumbus, Cypselus apus, Dendrocopus major, Hirundo rustica, Parus major, Parus coeruleus, Sitta europaea, Accentor modularis (Rede med 5 Unger), *Luscinia philomela* (Rede med 5 grønne Æg), *Sylvia cinerea, atricapilla, hortensis, arundinaceus, phragmitis, trochilus, sibilatrix, Regulus cristatus, Anthus arboreus, Turdus musicus, Ligurinus chloris, Cannabina linota, Emberiza schoeniclus, E. citrinella.* — Rude Skov: *Garrulus glandarius, Dendrocopus major, Sylvia sibilatrix, Accipiter nisus.* *A. K. & M. Th.*

Den 1. til 3. Juli 1924. Ekskursion til Bornholm sammen med Dansk botanisk Forening.

Fra Naturhistorisk Forening deltog 3 Medlemmer, fra Botanisk Forening 9 foruden 4 Gæster, af hvilke man især maa være Lektor P. A. Larsen, Rønne, taknemlig for Turens fortrinlige botaniske Udbytte. For at skaffe en lokalkendt zoologisk Leder havde Naturhistorisk Forening henvendt sig til Lektor Tryde, Rønne, der velvilligst havde paataget sig Hvervet, men ved Sygdom blev forhindret i at deltage. Som Følge af de nævnte Forhold maatte Turens Udbytte væsentlig blive af botanisk Art; m. H. hertil kan henvises til K. Wiinstedt's Ekskursionsberetning i Botanisk Tidsskrift, Bd. 38, Hefte 4, 1924, S. 313—317.

1. Juli. Deltagerne spaserede til Blykobbe Plantage. Fra Bagaa kørtes i Automobil til Hasle, hvor man spiste Frokost, og derefter videre til Jons Kapel. Herfra gik man over Ringebakkernes Hede; ved Vang gik man ned til Strandkanten og fulgte den til Hotel Finnedalen, hvor man steg op og gennem Finnedalens Birkeskov og tværs over Mølledalen naaede Hammershus. Mølledalen gjorde med sin næsten tropiske Frodighed, væsentlig af Ramsløg og Bregner, et uforglemmeligt Indtryk paa samtlige Deltagere. Efter Middagen paa Blanchs Hotel spaserede man til Sandvig og tog med Tog tilbage til Rønne.

2. Juli. Med Morgentoget til Rø, hvorfra Deltagerne spaserede gennem Dynddalen og langs Kysten til Helligdommen. Efter Frokost gik man over Salene til Gudhjem. Med Toget tilbage til Rønne.

3. Juli. Med Automobil ad den sydlige Landevej fra Rønne til Kuregaard ved Læsaa. Herfra gik man til Boderne ved Aaens Udløb og saa Graptolithskiferen. Gennem Klitterne spaseredes til Eskildsgaard, hvorfra man kørte til Aakirkeby. Efter Frokost kørtes til Ekkodalen, gennem hvilken man gik til Jomfrubjerget, hvor den tiltagende Regn nødsagede Deltagerne til hurtigere end beregnet at vende tilbage til Rønne. *K. St.*

Den 14. September 1924. Ekskursion til Gribskov. Leder: Kommunelærer **E. Nielsen**. Deltagernes Antal var 15.

Ekskursionsstedet var Gribsøs nærmeste Omegn. Før Frokost gennemgik Lederen ved Hjælp af Tegninger og Fotografier *Hyptiotes paradoxus*' og *Linyphia triangularis*' Fangenet, hvorefter disse Edderkopper og deres Net blev fundet i en Granplantage. Der blev vist, hvorledes man kan tage et plant Fangenet med hjem til Undersøgelse og Opbevaring.

Af andre Edderkopper fandtes efter Frokost: *Epeira diademata, E. umbratica, E. quadrata, E. marmorea* med dens Varietet *E. pyramidata, E. cucurbitina; Tetragnata extensa* samt dennes og *T. striata*'s Ægspind; *Cyrtophora conica; Meta segmentata; Zilla atrica; Amaurobius fenestralis; Dictyna arundinacea; Theridium lunatum, Th. ovatum; Linyphia phrygiana; Leptyphantes obscurus; Ocyale mirabilis.* Af de nævnte Arter fandtes ogsaa Fangenettet, naar undtages den sidstnævnte, der intet saadant anlægger, men den blev taget med sin Ægkugle i Retræten. Af flere af de andre nævnte Arter fandtes ligeledes Ægspind, f. Eks. *E. cucurbitina*'s grøngule, *Th. lunatum*'s med Farve som visne Blade og *Th. ovatum*'s blaa Ægspind.

En *Clubiona sp.* spandt sig Gang paa Gang ned fra en Finger og udsendte Flyvetraad, som ofte heftede sig til Tilskuerne og dannede Bro fra Edderkoppen, som straks prøvede at undslippe langs denne.

Deltagerne fik at se, hvorledes Træhvepsen *Sirex juvencus* lagde Æg i en fældet Træstamme.

Paa en moseagtig Slette laa en Træstamme, der var beboet af Myrer; under Barken og helt nede under de af Smuld byggede Gallerier fandtes for første Gang i Danmark Larver af Fluen *Microdon mutabilis.* Denne Flues Larver blev 1823 opstillet som en ny Slægt af Landsnegle *(Parmula)*, og igen Aaret efter som en anden Slægt af Snegle *(Scutelligera)*; først 1839 bestemtes de endelig som Microdonlarver. Paa samme Lokalitet fandtes Larver af Svampemyggene: *Phronia strenua, P. johannae* og *Epicrypta scatophora.* E. N.

Den 8. Maj 1925. Ekskursion til Saltholm under Ledelse af Vekselerer E. Lehn Schiøler.

Til aftalt Tid samledes Deltagerne i et Antal af lidt over 60 ved Knippelsbro og afsejlede i den dér ventende Motorbaad. Paa Grund af Taage fortøjedes en Times Tid ved Molen ved Havnens søndre Udløb; medens man ventede paa Klaring i Vejret, saaes og hørtes gul og hvid Vipstjert, og en lille Flok Engpibere slog sig ned paa Molen et lille Øjeblik. Da Taagen lettede, sejledes videre til Saltholm, og Dagen tilbragtes i det skønneste Vejr med at gennemkrydse Holmens nordlige og midterste Del.

Nedenstaaende Arter iagttoges:

Nettion crecca (flere Par), *Dafila acuta* (And med Ællinger, nogle Dage gamle, Rede med Æg og taldrige Andrikker), *Anas platyrhyncha* (flere Andrikker og nogle Ænder, desuden Rede med 11 „spraaede“ Æg), *Querquedula querquedula* (en enkelt Andrik), *Spatula clypeata* (Rede med 11 Æg og desuden andetsteds paa Holmen And og Andrik), *Cygnus cygnus* (en Sangsvane svømmede ude i Sundet ved Holmens Østkyst; maaske var den anskudt), *Tadorna tadorna* (2 Par saaes), *Somateria mollissima* (et Par Stykker saaes, og tre raadne Æg fandtes flydende i et Vandhul), *Mergus serrator* (nogle Par saaes svømmende ved Østkysten), *Anser spec.?* vist *fabalis* (blev set af nogle af Deltagerne), *Astur nisus* (en blev set tagende en Svale i Flugten (!), *Ægialitis hiaticula* (nogle faa Par; Arten er aftaget som Ynglefugl paa Holmen), *Vanellus vanellus* (mange; lige udkrøbne Unger og Reder med Æg saaes), *Haematopus ostralegus* (mange; Æglægning vist næppe begyndt), *Philomachus*

pugnax (en Del; nogle af Deltagerne vare saa heldige at se 6—7 kæmpende Haner), *Tringa calidris* (ikke saa talrig som tidligere; Rede med Æg fandtes), *Erolia alpina schinzii* (ret talrig; rugende; Reder med Æg fandtes, dog ogsaa Dununger), *Larus ridibundus* og *canus* (mange af begge Arter), *Larus argentatus* (nogle), *Larus marinus* (et Par udfarvede og nogle yngre Fugle saaes), *Sterna albifrons* (et Par saaes ved Østkysten), *Perdix perdix* (eet Par), *Oenanthe oenanthe* (1 Hun), *Phoenicurus phoenicurus* (Hunner), *Sylvia atricapilla* (1 Hun), *Phylloscopus trochilus* (flere saaes og hørtes), *Motacilla alba* og *flava*, *Sturnus vulgaris*, *Riparia riparia* (talrig), *Hirundo rustica* (enkelte), *Alauda arvensis*, *Passer domesticus* og *montanus*, *Carduelis cannabina*, *Corvus cornix*.

E. L. S.

Den 24. Maj 1925. Entomologisk Ekskursion til Hornbæk. Leder: Fuldmægtig A. West.

Deltagerne tog med Toget til Hornbæk, hvor man spiste Frokost i Hotel „Bondegaarden"; derefter spaserede man rundt i den østlige (gamle) Plantage. Paa Grund af ugunstigt Vejr var der kun faa Insekter fremme; Kl. 2 begyndte det at regne, og da der ikke var Udsigt til Bedring i Vejret, tog man hjem ved 3-Tiden. 8 Medlemmer deltog.

Af Biller iagttoges følgende: Paa Birk: *Dolopius marginatus* L., *Athous subfuscus* Müll., *Corymbites tesselatus* L., *Cryptocephalus labiatus* L., *Strophosomus rufipes* Steph., *Polydrosus tereticollis* De Geer, *Acalyptus carpini* Hbst., *Orchestes rusci* Hbst., *Orchestes stigma* Germ., *Apion assimile* Kirby, *Rhynchites betulae* L. Paa Fyr: *Halyzia octodecimguttata* L., *Anatis ocellata* L., *Paramysia oblongoguttata* L., den her i Landet meget sjældne Smelder *Corymbites impressus* Fabr., der kun er kendt fra Hornbæk Plantage og Teglstrup Hegn, Larven af *Pytho depressus* L., *Hylecoetus dermestoides* L., *Pityogenes bidentatus* Hbst.; de to Billearter, som undertiden træffes i sidstnævntes Gange, nemlig *Hypophloeus linearis* Fabr., der fortærer Barkbillens Yngel, og *Cryptophagus cylindrus* Kiesw., hvilke Arter forøvrigt er meget sjældne her i Landet, men som tidligere er fundne i Hornbæk Plantage, og som det var eet af Ekskursionens Formaal at observere, lykkedes det desværre ikke at støde paa. Ved Stranden: *Cercyon litoralis* Gyll. og *depressus* Steph. (under Tang) og *Psylliodes marcida* Ill., baade Imago og Larve (paa Bladene af *Crambe maritima*).

A. W.

Den 14. og 15. Juni 1925. Ornithologisk Ekskursion til Dybsø, Enø og Sallerup Nor under Ledelse af Lektor Johs. Ferdinand

De 8 Deltagere ankom til Næstved Kl. 10[14] Fm. Med Automobil, som Foreningen begge Dage stillede til Raadighed, kørtes til Vejløgaard. Her var det paa Grund af meget stærk sydvestlig Blæst haabløst at forsøge paa med Robaad at naa over til Dybsø. Kørselen fortsattes derfor øst om og syd om Dybsø Fjord til Nordspidsen af Svinøland, hvor Overfarten til Dybsø lykkedes. Den træløse Ø, som udelukkende henligger til Græsning for Kreaturer, bestaar i den sydlige og vestlige Del af Moræneler med et Par lave Bakker, i den nordlige Del af Saltvandsalluvium (Eng) med større eller mindre lavvandede

Huller, som tildels udtørres om Sommeren. Øens Fugleliv karakteriseres ved de talrige Storm- og Hættemaager (*Larus canus* og *ridibundus*), hvis øredøvende Skrig til Stadighed følger de besøgende. Rederne, som findes baade i Græsset og Tangen ved Strandbredden, ligger ret spredt, men dog i Kolonier — hver Art for sig. Reder med Æg eller smaa Unger saas i Mængde; hvor mange Ynglefugle der er, kan der vanskeligt skønnes over. Ægindsamling i 1923 gav ca. 25,000 Stk. Der yngler aarligt en Del Terner (*Sterna hirundo* og *macrura*), og man fandt Reder med følgende Antal Æg: 2, 3, 3, 2 samt 4 smaa Unger (af disse var i ethvert Fald 1 Stk. *macrura*). Af Svømmefugle saas iøvrigt 5 Svartbager (*Larus marinus*), 1 Par Skeænder (*Spatula clypeata*) samt nogle Gravænder (*Tadorna vulpanser*).

Af Vadefugle er Strandskaden (*Hæmatopus ostralegus*) hyppigst — den træffes spredt over hele Øen (1 Rede: 3 Æg), hvorimod der af Rødben (*Totanus calidris*) saas faa og af Viber (*Vanellus cristatus*) kun 2. Klyden (*Recurvirostra avocetta*), som i 1923 ynglede i en Koloni paa antagelig henimod 20 Par, havde tildels forladt Øen, idet der kun saas 4 eller 5 voksne Fugle samt 2 Reder hver med 4 Æg. Naar hertil føjes en Rede med 10 Æg af Blishøne (*Fulica atra*) samt nogle Stæreflokke (*Sturnus vulgaris*), er Artslisten færdig. Gunstigere Vejrforhold vilde sikkert have øget Artsantallet noget.

Under Overfarten med Robaad til Enø Oredrev var der rig Lejlighed til at se Dykkefærdigheden hos Gravandens Unger, idet 3 Kuld af forskellig Alder forlystede Deltagerne, medens de gamle protesterende fløj omkring.

Enø Oredrev (Saltvandsalluvium), der henligger som Fællesgræsgang for Enøgaardmændenes Kreaturer, bliver aabenbart fattigere paa Fuglearter, til Trods for at et Par Smaaøer samt den *Corophium*-Vade, som strækker sig over til Vejlø Skov, er ualmindelig velegnet for Vade- og Svømmefugle. Dog vil man endnu i Yngletiden sjeldent søge forgæves efter fødesøgende Klyder. Deltagerne saa ogsaa henimod en Snes af denne Fugl, hvoraf enkelte viste en Optræden, som kunde tyde paa, at de havde Unger; men trods energisk Eftersøgning lykkedes det ikke at finde disse. Paa den hastige Vandring over Oredrevet saas Strandskader enkeltvis langs Nordkysten, endvidere enkelte Rødben, 1 Par Ryler (*Tringa alpina Schinzii*) samt faa Viber (1 Unge); ved Sydkysten: 1 Par Dværgterner (*Sterna minuta*) samt enkelte Præstekraver (*Ægialitis hiaticula*). Med Automobil kørtes gennem Karrebæksminde til Næstved, hvor der overnattedes.

Den 15. Juni gik man fra Morgenstunden til Herlufsholm, hvor bl. a. Museet besøgtes. Efter Frokost i Næstved kørtes til Sallerup Gaard. Fodturen begyndte, hvor Sognevejen Nordvest for denne Gaard fører over den inddæmmede Fjordarm, som kaldes Sallerup Nor. Man fulgte den østlige Afvandingskanal mod Nord forbi den lille Sø, som ligger midt i Noret, hvorefter man gik omkring denne og tilbage til Udgangspunktet. Den sydlige Del af Noret er for en stor Del meget sandet Havbund med ret sparsom Græsvækst og spredte, næsten vegetationsløse Pletter. Bag Grøfterne findes frodigere Enge. I denne Del af Noret saas et Par Klyder (ynglende?), 2 Par Dværgterner, 2 Brushøns (*Machetes pugnax*), mange Viber (den talrigeste Art med 6, faa Dage gamle Uger), mange Rødben samt enkelte Par Præstekraver (*Ægialitis hiati-*

cula). Naar dertil føjes 1 Bekkasin (*Gallinago scolopacina*), som advarende fløj op, samt 2 Strandskader, en enkelt Gul Vipstjert (*Motacilla flava*) og enkelte Engpibere (*Anthus pratensis*), er Artslisten sikkert fuldstændig.

I den nordlige Del af Noret var Billedet anderledes; den for Tiden næsten udtørrede Sø laa midt i en stor Rørskov, som mod Øst omgives af Enge. I denne Del af Noret saas nogle Brushøns, hvoraf kun enkelte endnu bar Kraver — een af disse gjorde et Tilløb til Kamp; den 31. Maj havde Lederen set 14 Brushaner paa 2 Skoggerpladser. Rødbenen var talrig (20—30), ligesom Viben og Rørspurven er meget talrig i Rørene. Et Par Blishøns havde halvvoksne Unger. Iøvrigt var det Svømmefuglene, som dominerede! Fra en Hættemaagekoloni i Rørene hørtes stadig Larm, og svømmende eller flyvende saas mellem 50 og 75 Ænder, som paa Grund af Blæsten ikke var lette at bestemme; 20—25 Stk. var smaa, det vil sige enten Krik-, Atling- eller Skeænder (*Anas crecca, A. querquedula, Spatula clypeata*). Med Sikkerhed saas 4 Skeænder (♂♂), faa Atling (♂♂) samt 5 Pibeænder (♂♂, *Mareca penelops*). Den 31. Maj var set: Graaænder (*Anas boschas*), Spidsænder (*Dafila acuta*), Skeænder og Atlingænder; Taffelanden (*Nyroca ferina*) siges at yngle her, men saas ikke. Som en Overraskelse saas en Rørhøg (*Circus æruginosus*) lette fra Rørene og flygte ad Agnø til.

Ogsaa anden Dag forringedes Udbyttet paa Grund af Blæsten, idet Iagttagelsen vanskeliggjordes.

Kl. 5 var man i Næstved, og Kl. 6 tog Deltagerne tilbage til København.

Johs. F.

Den 27. September 1925. Ekskursion med Biologisk Stations Dampskib „Japetus Steenstrup“ under Ledelse af Dr. phil. C. G. Joh. Petersen. Deltagere 31.

Ekskursionen havde fundet overordentlig tilslutning, idet der foruden de 31, som deltog (flere kunde ikke medtages af hensyn til pladsforholdene ombord), havde meldt sig endnu ca. 30 deltagere. Man samledes kl. 10 i Tuborg Havn, hvorefter der sejledes op gennem Sundet øst og nord om Hveen og derefter tilbage vest om nævnte ø. Kl. ca. $4^1/_2$ var man atter i Tuborg Havn. Under sejladsen op gennem Sundet toges bundprøver med bundhenter for at demonstrere de forskellige dyresamfund, nærmest land *Macoma baltica*-samfundet, derefter *Abra alba*-samfundet og endelig *Amphiura filiformis*-samfundet i de dybere partier. Deltagerne fik lejlighed til at stifte bekendtskab med en række for disse dyresamfund karakteristiske arter. Der blev desuden ved Hveen fisket med trawl, hvorved der blev lejlighed til at demonstrere en del af vore almindelige fiskearter (der blev taget et par meget smukke eksempl. af *Gadus pollachius*) samt andre større dyreformer (bl. a. et eksemplar af *Lithodes maja*). Ved ekskursionens afslutning fordeltes det betydelige antal af opfiskede torsk mellem deltagerne. Under ekskursionen, som var begunstiget af et prægtigt og stille vejr og i alle henseender var meget vellykket, fik lederen yderligere lejlighed til at demonstrere sin opfattelse af hvalernes svømning, idet en af skibets joller blev drevet frem med en “kunstig“ hvalhalefinne af staal.

R. S.

Den 11. Oktober 1925. Besøg paa den kgl. Veterinær- og Landbohøjskole.

De ca. 30 Deltagere blev modtaget i et af de større Auditorier i Hovedbygningen af Skolens Inspektør, Hr. Landbrugskand. Windfeld, som gav en kort Oversigt over Skolens Oprindelse og Udvikling. Der findes nu 6 Studieklasser: Veterinærer, Skovbrugere, Landbrugere, Havebrugere, Mejeribrugere og Landinspektører. Den sidste, omfattende Udvidelse, der begyndtes i 1918 og skal være afsluttet i 1926, har givet en Række af Fag meget paakrævede Forbedringer i deres ydre Forhold, dels ved Bygning af flere nye Huse, dels ved Indkøb af det tidl. „Københavns Sygehjem" paa Rolighedsvej med dertil hørende store Haveareal.

Med Inspektøren i Spidsen begyndte man nu Rundgangen gennem et Udvalg af de gamle og nye Lokaler. Fra Hovedbygningen gik man til det moderne indrettede Bibliotek (80.000 Bd.). Gennem den normalanatomiske Dissektionssal gik det videre til den zoologiske Samling, hvis instruktive Præparater, der for allerstørste Delen skyldes Prof. Boas, interesserede Deltagerne meget. I den nyopførte Bygning for patologisk Anatomi osv. foreviste Prof. Følger sin meget moderne, rummelige og smukt indrettede Afdeling for pathologisk Anatomi, medens Prof. Christiansen var Vejleder i sin ligeledes moderne indrettede Afdeling for Bakteriologi etc. Desværre tillod Tiden ikke, at Drivhusene blev beset. Man spaserede nu over til Rolighedsvej, hvor det plantefysiologiske Laboratorium og Arvelighedslaboratoriet besaas; hele Besøget varede godt 3 Timer. *M. Th.*

Den Schibbye'ske Præmie.

Præmien for Aaret 1924 fordeltes med 300 Kr. til Exam. polyt. *A. Rosenkrantz* for hans Afhandling: „De københavnske Grønsandslag og deres Placering i den danske Lagrække", trykt i Medd. fra Dansk geologisk Foren., Bd. 6, Nr. 23, 1924, og 200 Kr. til Mag. scient. *H. Ødum* for hans Afhandling: „Senon og Danien ved Voxlev", Faunaen, trykt i Danmarks geologiske Undersøgelse, II. Række, Nr. 39, 1923.

Beretning for Aaret 1925 afgivet af Udvalget for Naturfredning.

Udvalget for Naturfredning tillader sig hermed i Overensstemmelse med sin Forretningsorden at fremsende en kortfattet Oversigt over sin Virksomhed i 1925.

Suserup Skov. Udvalgets Forslag, formuleret af Professor Wesenberg Lund, om Fredning af denne Skov har vundet Bifald hos Overinspektionen

for Sorø Skove. Til at træffe nærmere Aftale med Overinspektionen om Formen for Omraadets Fredning delegerede Udvalget Professorerne Wesenberg-Lund og Ostenfeld, og der er senere tilflydt Udvalget en Afskrift af Planen for Skovens Behandling i Fremtiden. — Denne er godkendt af Ministeriet.

Tibirke Bakker. Efter at Sagen, der var indledet forrige Aar, har været drøftet gentagne Gange i Udvalget og — paa Foranledning af Borgmester Kaper — været under Debat mellem Repræsentanter for Udvalget og for Lodsejerne, dels paa Raadhuset, dels paa Aastedet, er den for Udvalgets Vedkommende afsluttet med, at dette ikke mente at nære Betænkeligheder ved dels at henvise Konsortiet til at søge Naturfredningsforeningen interesseret i at forsøge at faa Arealet naturfredet af botaniske og landskabelige Hensyn, eventuelt underlagt Skovvæsenet, dels, naar Sagen bragtes saaledes frem, at tilsige den Udvalgets Anbefaling. Lodsejerne havde ogsaa ønsket Udvalgets Hjælp til at faa en Udtørring af Ellemosen hindret, et Ønske, Udvalget godt kunde slutte sig til. Planen om Udtørring er imidlertid bortfaldet indtil videre paa Grund af dens Urentabilitet og tør antagelig betragtes som bortfaldet.

Strødam. Som det vil være bekendt gennem Meddelelser i Dagspressen, er denne Ejendom nu blevet naturfredet — i visse Henseender, f. Ex. hvad angaar Færdsel, endog i udpræget Grad — og underlagt Universitetet. Udvalget har fra Godsejer Jarl modtaget Tak for sin Virksomhed i denne Sag, ligesom Udvalget har tilskrevet Hr. Jarl og takket ham for hans Deklaration.

Vandbeholder i Hald Egeskov. Direktoratet for Statsskovbruget har, foranlediget ved et Andragende fra „Folkekuranstalten“ om Tilladelse til, at der opførtes en Vandbeholder i den fredede Del af Hald Egeskov, forespurgt Udvalget, hvorledes dette vilde stille sig hertil. Udvalgets Medlem Kammerherre Müller, der sidder inde med et nøje Kendskab til Forholdene paa Stedet, udarbejdede en Svarskrivelse, som derpaa er videresendt. Svaret gaar ud paa, at Udvalget paa det indstændigste fraraader, at Tilladelsen gives for det oprindelig paatænkte Sted, medens der henvises til eventuel Opførelse paa andet, nærmere betegnet Punkt. Udvalgets Protest er blevet taget til Følge.

Boserup Skov. Lektor, Dr. phil. Boysen Jensen har til Udvalget indsendt en Anmodning om, at dette vilde søge at faa hensynsløs Plukning og Opgravning af Skovbundsplanter i Boserup Skov hindret. Udvalget har ladet Skrivelsen gaa videre til Københavns Kommune, der er Ejer af Skoven, med Anbefaling af, at der træffes passende Forholdsregler i nævnte Retning.

Tuul Sø. Spørgsmaalet om en Sænkning af Vandspejlet i Tuul Sø har været debatteret — uden at Sagen dog har været til Udvalgets Erklæring. Professor Wesenberg-Lund, der af Ministeriet har været hørt som Sagkyndig, har til Udvalget refereret Sagens Forløb i store Træk. Sagen er videresendt til Overfredningsnævnet og er nu, efter hvad der uofficielt er meddelt Udvalget, foreløbig stillet i Bero.

T i s s ø. Da der mentes at være Fare for en Sænkning af Tissø saavel som af en større Del af Halleby Aas Løb, har Udvalget søgt Oplysninger hos „Det danske Hedeselskab“s kulturtekniske Afdeling i Slagelse, under hvilken Institution Sagen sorterer. Herfra foreligger Svar, hvoraf det fremgaar, at den Sænkning, der er Tale om, er ganske uvæsentlig.

M a r s k e n v e d T ø n d e r. Udvalget har drøftet Spørgsmaalet om Afvanding af de store Marskarealer, men har ikke haft Lejlighed til at blive bekendt med disse i Enkeltheder. Udvalget har delegeret d'Hrr. Mentz, Wesenberg-Lund og A. Jessen til at træde i eventuel nærmere Forbindelse med Marskudvalget.

G r æ s h o l m e n v e d C h r i s t i a n s ø. Hr. Stud. mag. Arne Larsen har tilsendt Udvalget en Skrivelse, hvori han beder det gøre Skridt til, at Fuglelivet paa Græsholmen fredes. Skrivelsen er sendt videre til Naturfredningsraadet med Udvalgets bedste Anbefaling.

J a g t l o v e n. Muligheden af at søge Lovgivningsmagten paavirket til at ændre visse Bestemmelser i den nye Jagtlov vedrørende Rovfuglene, hvis Kaar herefter vilde blive meget slette, har været drøftet i Udvalget, som dog har ment ikke at kunne optræde alene her. Stamm og Wesenberg-Lund delegeredes til at undersøge Betingelserne for Samarbejde med andre Organisationer. Senere er der — som bekendt — sket Henvendelse til Lovgivningsmagten fra det af Videnskabernes Selskab nedsatte Udvalg og andre Organisationer. Videnskabernes Selskabs Udvalg har overdraget Professor Wesenberg-Lund at foretage det videre fornødne, og Wesenberg-Lund staar saaledes nu som Repræsentant saavel for Udvalget for Naturfredning som for andre Institutioner, der i dette Spørgsmaal virker i samme Retning.

N a t u r f r e d n i n g s l o v e n. Da der andet Steds er fremkommet Meddelelse om, at Udvalget har givet sin Tilslutning til det af „Foreningen for Naturfredning“ fremsatte Forslag til Revision af „Lov om Naturfredning“ uden Tilføjende om, at dette skete med et vist Forbehold, mener Udvalget at skylde Dansk naturhistorisk Forening en nærmere Redegørelse for Sagens Forløb:

Enkelte af Udvalgets Medlemmer modtog allerede 1924 underhaanden Forespørgsel fra Foreningen for Naturfredning, om Udvalget mentes at ville træde i nærmere Samarbejde med denne Forening, hvilket vilde være særdeles aktuelt nu, da Naturfredningsloven skulde revideres, og Foreningen har senere henvendt sig direkte til Udvalget desangaaende. Straks derpaa forespurgte Udvalget Foreningen, om det kunde faa udleveret en Genpart af Foreningens Forslag til Lovændringer, for at Udvalgets Medlemmer i Ro og Mag kunde gøre sig bekendt med Forslaget. — Dette nægtedes, men Foreningen bad Udvalget delegere 3 Medlemmer til i Fællig med 3 Delegerede fra Foreningen at drøfte det omtalte Forslag. Videre udtalte Foreningen, at Sagen hastede, og at der var m e g e t r i n g e T i d t i l F o r h a n d l i n g. Udvalget gik dog ind paa at drøfte Sagen under disse for det ulige Kaar — og delegerede hertil Mentz, Ostenfeld og Wesenberg-Lund. Det lykkedes d'Hrr. ved et Møde,

der trak ud til en sen Nattetime, at faa indført forskellige Ændringer i Foreningens Forslag, men de mente ikke ubetinget at kunne svare for Udvalgets fulde Tilslutning. Efter at have faaet dette Resultat refereret i et Udvalgsmøde har Udvalget meddelt Foreningen, at det i det store og hele kunde tiltræde Lovforslaget i den nu foreliggende Form, men maatte forbeholde sig at overveje enkelte Punkter og senere udtale sig herom. — Senere har Udvalget overfor Justitsministeriet, der har tilsendt Udvalget Lovændringsforslaget, udtalt sig mere indgaaende om sin Stilling til dette.

Udvalgets Skrivelse lød saaledes:

“Udvalgets Skrivelse af 27. November 1924 til Foreningen for Naturfredning tog særlig Sigte paa Forskellen mellem Foreningens Lovforslag før og efter at Udvalgets Delegerede havde haft Lejlighed til at fremkalde enkelte Ændringer, idet Udvalget ansaa disse Ændringer for vigtige Forbedringer.

I nærværende Skrivelse til det høje Ministerium skal der derimod gives nogle Bemærkninger om Forholdet mellem den nu gældende Naturfredningslov og det af Foreningen for Naturfredning til Ministeriet indleverede Forslag. Om man end ikke paa ethvert Punkt kan anerkende Forslaget, skal det dog straks siges, at det paa flere Punkter byder væsentlige Forbedringer af Loven.

1) Dette gælder saaledes Definitionen i § 15 af, hvad der skal forstaas ved fri Strandbred, nemlig at den ikke er økonomisk eller havemæssigt udnyttet. Udtrykket “økonomisk“ bør dog som Modsætning til „havemæssigt“ være „landbrugsmæssigt“ eller „landøkonomisk“, thi om Udnyttelsen betaler sig eller ej. er i denne Sammenhæng ligegyldigt.

2) Udvidelsen af den fri Færdsel til ogsaa at gælde Søbredder maa ogsaa betragtes som en Forbedring, men der savnes her en Sætning om, at hvor der paa andre Steder i Loven kun tales om Strandbred, skal der herved tillige forstaas Søbred.

3) Ligeledes maa det betragtes som en meget væsentlig Forbedring, naar der i Forslaget regnes med, at Erstatninger ved Fredninger udredes helt af Statskassen og ikke delvis af Amterne. Thi det maa antages, at de nugældende Bestemmelser om Amtsdeltagelse i adskillige Tilfælde kan virke hæmmende paa Nævnenes Initiativ til at bringe lokale Fredninger i Forslag, da de derved paafører deres Sognebeboere en Udgift.

I nogle Tilfælde er den gældende Bestemmelse ganske uretfærdig, thi for store Dele af et Amt kan en Fredning være af ret underordnet Betydning, medens den for andre Amter kan være af stor Værdi. Som Eksempel kan saaledes nævnes, at en Fredning af Møens Klint er af underordnet Betydning for den største Del af Præstø Amt, til hvilket Klinten hører, medens den er af stor Betydning for Maribo Amt og København og Københavns Amt, fra hvilke Steder et langt større Antal Besøgende kommer til Klinten.

4) Sammenligner man de i Lovforslaget angivne Fredningsmyndigheder og Reglerne for Fredningssagers Behandling med den nugældende Naturfredningslovs Bestemmelser, vil der vise sig at være stor Forskel i Principerne. Dette er udførligt belyst i Naturfredningsraadets Skrivelse af 7. Maj d. A. til det høje Ministerium, og Udvalget for Naturfredning slutter sig til de deri fremsatte Betragtninger.

Thi ogsaa vi mener, at den gældende Naturfredningslov — bortset fra enkelte mindre Brist, der kan bødes paa ved en Revision — har virket godt gennem de forløbne Aar, saaledes at der ikke vil være Grund til at fravige de gældende Principer og i Stedet indføre en lønnet, embedsmæssig Administration, af den i Foreningens Lovforslag foreslaaede Karakter.

5) Tanken om at lade en Kortlægning og Beskrivelse foretage over de ejendommeligste og skønneste Landskaber har umiddelbart noget tiltalende ved sig, men naar der paa Grundlag af den skal udarbejdes en samlet Fred-

ningsplan med Angivelse af en bestemt Rækkefølge, hvori Fredningerne bør udføres, maa dette sidste anses for uigennemførligt. Thi Forhold, som man ikke paa Forhaand er i Stand til at overse, kan bevirke, at der netop i et givet Øjeblik maa gribes kraftigt ind paa Steder, der er opførte langt nede i Rækken paa Fredningsplanen, medens andre Steder, der er opført langt tidligere, uden Skade kan vente.

Et Overblik over fredningsværdige Objekter vil det dog være meget ønskeligt at fremskaffe, men dette kan gøres gennem Paabud til samtlige Nævn om at indsende slige Fortegnelser, der da bør kritisk gennemgaas af Naturfredningsraadet — som da selvfølgelig til et saa omfattende Arbejde maa have en lønnet Sekretær — ligesom Raadet selv maa have Ret til at fremskaffe de bedst mulige Oplysninger i denne Henseende. Det forventes yderligere, at Foreningen for Naturfredning og Udvalget for Naturfredning vil støtte denne Opgave.

6) Det i Naturfredningsraadets Skrivelse stillede Forlag om, at der ind under Loven ogsaa kan drages Fredninger af mere kulturel Art (Parker og nedlagte Fæstningsomraader), kan Udvalget fuldt ud tiltræde.

Men desuden maa dette have Lov at pege paa enkelte Punkter, som ikke er paaagtede hverken i den gældende Lov eller i Naturfredningsforeningens Forslag. Dette gælder saaledes Lovens bristende Evne til jævnsides med en Naturfredning at fremkalde en Kystfredning. og i enkelte Tilfælde tillige en Kystsikring. Som Eksempel kan her nævnes Møens Klint. Her er det ikke tilstrækkeligt at frede Klinten efter Naturfredningsloven, uden at der samtidig skabes en fuldstændig Fredning af Strandbredden og tillige en Sikring af denne. En Naturfredningslov bør derfor indeholde en Passus om, at ved Arealer, der grænser til Kyst, og som naturfredes, kan Fredningsmyndighederne (Nævn og Raad) stille Krav overfor Landbrugsministeriet om, at den tilgrænsende Kyst fredes, vel at mærke uden Dispensationer. Ligesaa, at det efter Indstilling fra Fredningsmyndighederne kan paalægges Ministeriet for offentlige Arbejder at udarbejde Plan for og fremsætte Lovforslag om Sikring af en saadan Kyst.

7) Udvalget henleder videre Opmærksomheden paa de meget forstyrrende Indgreb, der ved Grusgravning sker paa Arealer, der allerede er fredede eller fortjener Fredning. Bestemmelser til Forhindring af dette Forhold, der er hjemlet gennem ældre Forordninger og Love, maa søges gennemførte.

8) Til Siut skal kun peges paa Ønskeligheden af, at det gennem Loven paalægges samtlige Fredningsinstanser at indsende deres Kendelser, ikke alene til de øvrige i Loven angivne Fredningsfaktorer, men tillige til Foreningen for Naturfredning og Udvalget for Naturfredning, saaledes at et fuldstændigt Overblik over Sagernes Gang derved kan naas.“

Ved Ministeriets Forelæggelse af selve Loven er der i høj Grad taget Hensyn til det af Udvalget foreslaaede.

Landbrugsministeriet har anmodet Udvalget om at vælge 1) 1 Delegeret til Komiteen for Dyrehaven og 2) 3 Medlemmer til Komiteen for Statsskovene. Udvalget har valgt

1) Ostenfeld,
2) Ostenfeld, Mentz, Wesenberg-Lund.

Justitsministeriet har anmodet Udvalget om at fremkomme med Indstilling ved Beskikkelse af 2 Medlemmer til Naturfredningsraadet. Udvalget indstillede de to afgaaende Herrer Professor Helms og Højesterets-

sagfører Stein til Genvalg. Denne Indstilling fulgtes for Professor Helm's Vedkommende, medens Arkitekt Dyggve (indstillet af Naturfredningsforeningen) valgtes i Stedet for Stein.

Udvalgets Sammensætning. Efter at Kammerherre Müller, der har siddet i Udvalget siden dets Dannelse — i en længere Aarrække som dets Formand — og som har været Udvalget til uvurderlig Nytte ved sin store Indsigt i saa mange af de Spørgsmaal, der har været behandlet, har ønsket at træde tilbage paa Grund af Alder, har Dansk naturhistorisk Forening i hans Sted valgt kgl. Skovrider Fabricius til Medlem af Udvalget.

P. U. V.:

V. Hintze.

Medlemsliste

1. Januar 1926.

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Amdrup, M., Stud. art., Smallegade 52 A. F.	1925.
Andersen, N. C., Læge, Vinkelvej 6 B^2, V.	1924.
Andersen, J. P., Cand. mag., Suensonsg. 13^1. K.	1921.
Andersen, N. P., Kommunelærer, Bentzonsv. 9^2. F.	1923.
Anker, Jean, Underbibliotekar, Cand. mag., Læssøegade 1 A^3. N	1916.
Anthon, E., Frk., Helgolandsg. 9^3. B.	1907.
Arenholt, J., Læge, St. Kongensg. 23. K.	1925.
Asmund, B., Frk., Stud. mag., Snekkersten	1923.
Balslev, Vilh., Lektor, R., Skt. Knudsv. 3. V.	1923.
Bárðarson, G., Lærer, Akureyri, Island	1909.
Bardenfleth, K. S., Adjunkt, Mag. sc., Ellevængehus, Rungsted	1905.
Bartholin, C. T., Mag. sc., Uraniav. 19. V.	1869.
Bartholin, T., Adjunkt, Cand. mag., Ahlmanns Allé 11. Hellerup	1913.
Bech, Eline, Faglærerinde, Norasv. 11, Charlottenlund	1923.
Beck, H. G., Stud. mag., Ole Suhrsg. 14^3, K.	1925.
Berg, K., Cand. mag., Arresvej, Hillerød	1918.
Biilmann, Else, Frk., Stud. mag., Overbyes Allé 22, Valby	1925.
Blegvad, H., Dr. phil., Willemoesg. 6. Ø.	1907.
Borch, J. S. A., Distriktslæge, Allinge	1870.
Bornemann, A., Generallæge, Dr. med., K. DM., Toldbodg. 18^2. K.	1909.
Bovien, P. L., Underbibliotekar, Mag. sc., Classensg. 48^4. Ø.	1913.
Brinkmann, A., Prof., Dr. phil., Museumsbestyrer, Bergen	1899.
Bruun, A., Stud. mag., Regensen, St. Kannikestr., K.	1921.
Brændegaard, J. R. J., Adjunkt, Cand. mag., Ø.-Søg. 30 St. K.	1915.
Brøndsted, H., Adjunkt, Mag. sc., Birkerød	1911.
Buch, W., Stud. mag., Enighedsv. 12. V.	1925.
Buchwald, Grete, Frk., Duntzfeldts Allé 5, Hellerup	1923
Bræstrup, F. W., Stud. mag., Bagsværd	1926.
Bøggild, O. B., Prof., MVS., Østervoldg. 7. K.	1890.
Børgesen, C. F. E., Bibliotekar, Dr. phil., Rosenvængets Hovedv. 19. Ø.	1887.
Bøving, A., Dr. phil., Smithsonian Institution, Washington, U. S. A.	1902

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Bøving-Petersen, J. O., Lektor, Mag. sc., Gl. Kongev. 157⁴. V.	1913.
Christensen, Anna, Faglærerinde, Nørresøg. 27³. K.	1925.
Christiani, A., Ingeniør, Bølling Sø, Silkeborg	1906.
Christiansen, M., Prof., Dr. Abildsgaards Allé 14⁴, V.	1921.
Clément, Ad., Ingeniør, Ceresvej 2. V.	1907.
Dahl, S., Overbibliotekar, Nyelandsv. 71¹, F.	1906.
Degerbøl, M., Museumsamanuensis, Cand. mag., Fuglevadsvej 4, Lyngby	1915.
Deichmann, E., Frk., Mag. sc., Margrethev. 6, Hellerup	1915.
Didrichsen, A., Mag. sc., Bülowsv. 30¹, V.	1893.
Ditlevsen, A., Mag. sc., Knudsv. 6, Charlottenlund	1897.
Ditlevsen, E., Stud. mag., Annasv. 14, Hellerup	1923.
Ditlevsen, Hj., Museumsamanuensis, Mag. sc., Annasv. 14. Hellerup	1902.
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Ege, E., Frue, Bredg. 62. K.	1917.
Ege, F. V. R., Mag. sc., Hostrupsvej 5. V.	1915.
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Enevoldsen V., Cand. pharm., Birkeallé, Roskilde	1924.
Engelstoft, V., Frk., Stud. mag., Strandboulevarden 98. Ø.	1923.
Esben-Petersen, P., Borgmester, Silkeborg	1906.
Fabricius, O., Statsskovrider, Frederiksværk	1925.
Fasmer, H., Stud. mag., Sortedams Dossering 65 A². Ø.	1925.
Felding, M., Stud. art., Skovgaardsg. 1 B¹. Ø.	1925.
Ferdinand, Johs., Lektor, Cand. mag., Herlufsholm, Næstved	1907.
Findal, J. Kr., Lærer, Ingerslevs Boulevard 4, Aarhus	1923.
Fløystrup, A., Prof., Dr. med., R., Stockholmsg. 41. Ø.	1905.
Foged, N., Stud. mag., Ole Suhrsg. 4 St., K.	1924.
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Gandrup, Johs., Mag. sc., Besoeki Proofitation, Djember, Java	1915.
Gemzøe, K. J., Lektor, Cand. mag., M. f. D. R., Jomfrustien 7, Sønderborg	1902.
Gløde, F., Stud. mag., Dronninggaards Allé, Holte	1921.
Gormsen, E. M., Frk., Stud. mag., Kapelv. 42, N.	1923.
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Madsen, V., Statsgeolog, Dr. phil., R., Kastaniev. 10. V. .... 1890.
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Etudes sur l'anatomie et la systématique des Maillots (fam. *Pupillidae* s. lat.)

par

C.-M. Steenberg.

Avec 34 planches (I—XXXIV) et 50 figures dans le texte.

Introduction.

Il est entendu que le nombre des formes de Gastéropodes étudiées dépend toujours de deux facteurs: la taille des animaux et la facilité plus ou moins grande de rassembler les matériaux. Les Gastéropodes terrestres européens, grands et moyens, sont, pour la plupart, bien connus au point de vue anatomique; comme travaux systématico-anatomiques servant de modèles, il suffit de nommer des études telles que les recherches de P. Hesse sur les Hélicides et d'Antoni Wagner sur les Clausilies. Ce n'est que depuis quelque temps que les formes petites ou minuscules ont été, à part quelques exceptions, soumises à une étude plus détaillée, bien qu'on ait pu se les procurer avec une assez grande facilité. La raison toute naturelle en est qu'un examen plus minutieux n'a été rendu possible qu'au cours des 20 dernières années, les instruments (microscopes et autres appareils de dissection) ayant été alors considérablement améliorés.

Pour les Gastéropodes terrestres des autres parties du monde — excepté les Etats-Unis — on ne peut certainement pas s'attendre à ce qu'ils soient aussi parfaitement étudiés que les européens; mais pourtant l'anatomie de plusieurs Pulmonés, surtout chez des formes provenant de l'Amérique du Nord, du Mexique, des Indes occidentales et de l'Insulinde, du Japon et de l'Australie, a été l'objet de recherches assez approfondies. Pour les petites formes, presque aucune n'a été étudiée au point de vue anatomique; tout au plus connaît-on la radule et la mâchoire de quelques espèces isolées.

On voit ainsi que les petites formes ont toujours été négligées en comparaison des grandes, et elles continueront de l'être pour cette seule raison, qu'il sera difficile de trouver des personnes qui

puissent s'intéresser à recueillir ces humbles petits animaux. La famille qui comprend le plus grand nombre de petites espèces, est celle des *Pupillidae* (ou des *Pupidae*, comme elle a été le plus souvent appelée autrefois), et, par conséquent, il va sans dire que c'est la famille dont les parties molles sont le moins connues.

Quand j'ai entrepris, dans le présent travail, de traiter des Maillots (fam. *Pupillidae*), c'est pour remédier à ce défaut; malheureusement ce n'est qu'une petite partie de la grande lacune qui est ainsi comblée. A une seule exception près, il ne m'a été possible, en effet, que de me procurer des matériaux provenant de l'Europe; mais les formes européennes mêmes sont difficiles à recueillir, aussi bien vivantes qu'à l'état fixé, et mon travail sera donc avant tout une étude anatomique des espèces danoises des Maillots. J'ai essayé cependant, autant que j'ai pu, de trouver des représentants d'un aussi grand nombre que possible d'espèces européennes de *Pupillidae,* afin d'être par là en mesure d'étudier la composition de la famille, et de constater si elle était vraiment homogène ou si elle se composait d'éléments hétérogènes. Comme c'est ce dernier cas qui s'est trouvé être le vrai, et comme, de cette manière, la famille a été coupée en plusieurs groupes, mes recherches se sont étendues, en partie à caractériser, à l'aide des matériaux présents ou de la littérature malacologique, les groupes qui autrefois appartenaient à l'ancienne famille des *Pupillidae,* en partie à déterminer leur place par rapport aux autres familles du groupe des *Orthurethra* (Pilsbry).

Pour les examens, c'est dans tous les cas la méthode de dissection qui a été appliquée, celle-ci étant la seule qui donne une représentation exacte et une intelligence précise des formes, et qui exclue le plus souvent les erreurs d'interprétation que peut causer l'étude des coupes en série.

La dissection a été pratiquée à l'aide du microscope binoculaire de Zeiss, souvent à un grossissement de 200 fois, et en employant l'immersion dans l'eau, des oculaires orthoscopiques et une source lumineuse extrêmement intense. Pour la dissection faite avec des objectifs à immersion dans l'eau (Zeiss Pl.), nous nous sommes servi d'une coupe spéciale en zinc, construite pour cet usage, et dont le côté antérieur et les côtés droit et gauche sont inclinés, de sorte qu'on puisse obtenir la hauteur convenable de l'eau, en

même temps que les côtés inclinés permettent au cône lumineux de tomber sur l'objet et offrent l'espace suffisant pour le libre mouvement des instruments. Les instruments employés étaient des ciseaux à manche, des micropincettes et de fines aiguilles en acier poli, fabriqués spécialement pour la microdissection. L'objet était retenu par des crochets en forme d'arceaux, en fil d'argent extrêmement tenu. Dans les cas difficiles, la préparation a été colorée, mise sur une lame de verre et examinée sous le «Bitumi» de Zeiss et à des grossissements assez forts.

Pour la correction, surtout pour celle des structures intérieures, nous avons pratiqué des coupes en série. Celles-ci sont naturellement souvent nécessaires pour observer certains détails tels que la conformation interne de l'oviducte et du pénis. La mâchoire et la radule ont été préparées directement à l'aide de ciseaux et d'aiguilles, attendu qu'il a été prouvé que la potasse caustique attaque souvent les dents et les pointes dentaires, n'ayant qu'une longueur de quelques microns; cependant, des préparations à potasse caustique ont été faites pour le contrôle.

Quand cela était possible, j'ai examiné plusieurs individus de la même espèce, souvent un assez grand nombre, et surtout dans les cas qui offrent quelque difficulté. Si pourtant j'ai hésité çà et là dans l'explication de certains phénomènes de structure, c'est que d'une part mes matériaux ne se sont pas trouvés, dans ces occurrences, suffisamment bons, d'autre part que mes instruments n'ont pas été assez délicats. J'espère que, pour les recherches futures, je pourrai remédier à ce dernier défaut, ayant été mis en mesure, par la bienveillance de la Direction de la Fondation «Carlsberg», de me servir, dans les cas difficiles, du «Micromanipulateur» de Zeiss.

Je me permets d'offrir ici, à l'administration de cette fondation, mes remerciements les plus sincères pour cet important secours, ainsi que pour l'appui précieux qui m'a été prêté de plusieurs manières pendant mon travail. Je remercie également toutes les personnes, zoologues ainsi que particuliers, qui, en Danemark ou à l'étranger, m'ont secouru dans le travail, souvent assez pénible, nécessaire pour recueillir ou procurer des matériaux, ainsi que tous ceux qui, d'une autre manière, directe ou indirecte, m'ont prêté leur concours.

Recherches anatomiques antérieures.

Pour ce qui concerne les espèces européennes des *Pupillidae*, le siècle précédent a produit deux grands travaux anatomiques, ceux de Moquin-Tandon et de Lehmann.

De ces deux ouvrages, celui de Moquin-Tandon est le plus ancien (datant de 1855) et le meilleur. Dans son «Histoire naturelle des Mollusques terrestres et fluviatiles de France», tome II[41]), cet auteur donne, pour presque toutes les espèces des *Pupillidae* vivant en France, d'excellentes descriptions de l'aspect de l'animal; il parle du relief de la surface de la peau, de la tête et de ses organes (tentacules, yeux, bouche, lèvres, mâchoire), du «cou», du pied, de la «queue», du bord du manteau et du pneumostome. Quelquefois il donne également une courte exposition des organes intérieurs, principalement des organes génitaux, mais souvent aussi du tube digestif et du système nerveux.

Les espèces suivantes ont été étudiées:

Pupa (Torquilla) quinquedentata Born = *Chondrina similis* Brug., p. 352; figures de l'animal, de la mâchoire, du tube digestif, du pharynx et des organes génitaux, pl. 25, fig. 15—19.

P. (T.) megacheilos Crist. & Jan = *Chondrina m.*, p. 355; figures de l'animal, de la mâchoire, du tube digestif, du plafond de la cavité pulmonaire, du système nerveux, et des organes génitaux, pl. 25, fig. 23—28.

P. (T.) avenacea Brug. = *Chondrina a.*, p. 357; figures de la mâchoire et des organes génitaux, pl. 25, fig. 33; pl. 26, fig. 1.

P. (T.) Farinesii Des Moul. = *Chondrina (Modicella) farinesii*, p. 359; figures de la mâchoire, de l'otocyste, et des organes génitaux, pl. 26, fig. 5—7.

P. (T.) frumentum Drap. = *Abida f.*, p. 361.

P. (T.) ringens Mich. = *Abida r.*, p. 362; figures de la mâchoire et des organes génitaux, pl. 26, fig. 16—17.

P. (T.) Pyrenæaria Mich. = *Abida p.*, p. 364; description de la mâchoire et des organes génitaux, sans figures.

P. (T.) secale Drap. = *Abida s.*, p. 367; figure de la mâchoire, pl. 26, fig. 26.

P. (T.) Partioti Moq. = *Abida p.*, p. 369; figure de la mâchoire, pl. 26, fig. 30.

P. (T.) polyodon Drap. = *Abida p.*, p. 373; figure de la mâchoire, pl. 26, fig. 39.

P. (T.) multidentata Oliv. = *Abida variabilis* Drap., p. 375; figures de la mâchoire et des organes génitaux, pl. 27, fig. 5—6.

P. (T.) Braunii Rossm. = *Abida b.*, p. 377; figure de la mâchoire et de l'œuf, pl. 27, fig. 10 et 14.

P. (T.) affinis Rossm. = *Abida a.*, p. 379; figure de la mâchoire, pl. 27, fig. 15.

P. (T.) granum Drap. = *Granopupa g.*, p. 371; figure de la mâchoire, pl. 26, fig. 34.
P. (Sphyradium) cylindrica Mich. = *Sandahlia c.*, p. 382; figure de la mâchoire, pl. 27, fig. 20.
P. (S.) biplicata Mich. = *Agardhia b.*, p. 384; (aussi la radule).
P. (S.) dolium Drap. = *Orcula d.*, p. 385.
P. (S.) doliolum Brug. = *Orcula d.*, p. 386.
P. (Odostomia) pagodula Des Moul. = *Pagodulina p.*, p. 388; figures de la tête, de la mâchoire, et des organes génitaux, pl. 27, fig. 35—37.
P. (O.) cylindracea Da Costa = *Lauria c.*, p. 390; figures de la mâchoire, du tube digestif, et des organes génitaux, pl. 27, fig. 42-43; pl. 28, fig. 1.
P. (O.) muscorum L. = *Pupilla m.*, p. 393; figures de la mâchoire, du système nerveux, de l'otocyste, et de l'œuf, pl. 28, fig. 5, 6, 12, 13.
P. (O.) triplicata Stud. = *Pupilla t.*, p. 395; figure de la mâchoire, pl. 28, fig. 16.
Vertigo (Isthmia) muscorum Drap. = *Truncatellina cylindrica* Fér., p. 399; figure de la mâchoire, pl. 28, fig. 20.
V. (I.) edentula Drap. = *Columella e.*, p. 402.
V. (I.) pygmæa Drap., p. 405; figures de la tête, de la mâchoire, du tube digestif, du système nerveux, et des organes génitaux, pl. 28, fig. 38—42.
V. (I.) antivertigo Drap., p. 407; mâchoire, pl. 29, fig. 4.
V. (Vertilla) plicata A. Müll. = *V. angustior* Jeffr., p. 408.
V. (V.) pusilla Müll., p. 409; (organes de la cavité pulmonaire).
Helix (Lucena) pulchella Drap. = *Vallonia pulchella* Müll. + *V. costata* Müll., p. 141; figures de la mâchoire et du tube digestif, pl. 11, fig. 28—30.
H. (Fruticicola) aculeata Müll. = *Acanthinula a.*, p. 190; figure de la tête, pl. 15, fig. 5.
H. (Hygromane) rupestris Stud. = *Pyramidula r.*, p. 192; figure de la mâchoire, pl. 15, fig. 10.

Le second travail: R. Lehmann, «Die lebenden Schnecken und Muscheln der Umgegend Stettins und in Pommern», 1873[33]), a été publié par le Professeur E. v. Martens, après la mort de l'auteur.

Dans cette étude se trouvent décrits, outre l'aspect de l'animal, les organes génitaux, le tube digestif, la mâchoire et la radule (l'omission de la radule surtout, est, chez Moquin-Tandon, un défaut sensible). Sur les planches jointes au travail sont figurés, en général, la mâchoire, la radule, et les organes génitaux.[1])

Voici les espèces décrites et figurées:

Pupa minutissima Hart. = *Truncatellina cylindrica* Fér., p. 139—140; pl. 13, fig. 47.

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1) Là où rien de particulier n'est indiqué dans le tableau suivant, les trois organes sont reproduits

P. costulata Nilss. = *Truncatellina c.*, p. 146—148; pl. 14, fig. 51; représentation du tube digestif.
P. umbilicata Drap. = *Lauria cylindracea* Da Costa., p. 140—42; pl. 13, fig. 48; représentation du tube digestif.
P. edentula Drap. = *Columella e.*, p. 142—44; pl. 14, fig. 49.
P. muscorum L. = *Pupilla m.*, p. 144—46; pl. 14, fig. 50; représentation du tube digestif.
P. antivertigo Drap. = *Vertigo a.*, p. 148—150; pl. 14, fig. 52.
P. pygmæa Drap. = *Vertigo p.*, p. 150—152; pl. 14, fig. 53.
P. pusilla Müll.? = *Vertigo p.*, p. 152—153; pl. 14, fig. 54.
P. angustior Jeffr. = *Vertigo a.*, p. 153—156; pl. 14, fig. 55. La mâchoire et la radule seules ont été reproduites.
Helix pulchella Müll. = *Vallonia pulchella* Müll. + *V. costata* Müll., p. 90—92; pl. 11, fig. 30.
H. aculeata Müll. = *Acanthinula a.*, p. 95—97; pl. 11, fig. 32.
H. lamellata Jeffr. = *Acanthinula l.*, p. 80—82; pl. 10, fig. 25.

Ce travail n'a pas beaucoup d'importance. Les figures sont petites et peu distinctes, et les descriptions, qui, en ce qui concerne les organes intérieurs, sont bien plus détaillées que chez Moquin-Tandon, se trouvent souvent inexactes. Il faut faire remarquer cependant que l'auteur n'a pas publié et revisé lui-même le texte et les figures, et que ce sont d'ailleurs presque toujours les espèces les plus petites qu'il a examinées, espèces que Moquin-Tandon a laissées de côté et qui, à cause des instruments et des appareils optiques moins parfaits, alors en usage, étaient difficiles à étudier. Avec les microscopes de cette époque, des organes tels que la mâchoire et la radule auraient pu, cependant, être mieux observés et figurés; c'est ainsi que, déjà en 1864, l'Américain Morse[42]) a donné d'excellentes figures de ces organes chez les *Pupillidae.*

Les autres recherches du XIXe siècle se réduisent essentiellement, pour ce qui est des parties molles, à de courtes remarques sur une seule espèce ou sur deux ou trois.

Voici ces recherches rangées par ordre chronologique:

Joseph Leidy, 1851[4]), vol. I, p. 246 et 256, pl. IX, fig. 7—9, décrit et reproduit l'otocyste de l'*Helix pulchella* Müll. = *Vallonia p.*

Adolf Schmidt, 1855[56]), décrit les organes génitaux du *Pupa frumentum* Drap., var. *illyrica* = *Abida illyrica* Rossm., p. 42, pl. 10, fig. 81, et du *Pupa cinerea* Drap. = *Chondrina (Solatopupa) similis* Brug., p. 42, pl. 10, fig. 82.

Morse, 1864[42]), donne une exposition anatomique de l'*Acanthi-*

nula (Zoogenetes) harpa Say, p. 33—36, pl. I (utérus fig. 4; système nerveux fig. 5, otocyste fig. 8 et 9).

Goldfuss, 1856[19]), p. 52, et 1900[20]), p. 100, ainsi que Ashford, 1884[1]), p. 198—199, parlent des organes génitaux chez le genre *Vallonia,* avec étude spéciale du dard et de la poche de celui-ci.

Behme, 1889[3]), donne des renseignements précieux sur la structure du rein chez le *Pupa avenacea* Brug. = *Chondrina a.*, p. 13, et chez l'*Helix pulchella* Müll. = *Vallonia p.*, p. 5—6.

Wiegmann, 1893[86]), p. 186, 238 et 248, fait mention des organes génitaux et du rein du *Pupa muscorum* L. = *Pupilla m.*, et donne des indications concernant les organes génitaux du *Pupa frumentum* Drap. = *Abida f.*, du *Pupa secale* Drap. = *Abida s.*, et du *Pupa avenacea* Brug. = *Chondrina a.*

La même année V. Sterki[67]), p. 234, publia une excellente monographie du genre *Vallonia,* dans laquelle se trouve une courte description des organes mous: pied, ommatophores, foie et glande génitale; c'est pourtant principalement la mâchoire et la radule qui ont fait l'objet de l'examen et qui sont reproduites sur la pl. VIII; il sera parlé plus tard des espèces figurées.

Il se trouve enfin chez Semper et Simroth, 1894[59]), p. 70, un compte-rendu de la structure du rein et de la place qu'occupe le genre *Pupa* dans les groupes des Pulmonés, si on prend cet organe comme base de classification.

La seconde époque des recherches appartient à notre siècle. Les travaux traitant des *Pupillidae* datent des dernières 12 à 13 années. Il est vrai qu'une grande partie des renseignements que donne P. Hesse, sont empruntés à Wiegmann, et les recherches de celui-ci ont été faites à la fin du siècle dernier; mais d'une part ces renseignements se rattachent étroitement, sous plusieurs rapports, aux recherches des autres auteurs de notre siècle, et les égalent en perfection, d'autre part ils n'ont été publiés que dans celui-ci et ont été d'ailleurs largement commentés par Hesse. Ce qui caractérise cette période, c'est l'effort vers une compréhension claire de la structure des genres appartenant à la périphérie de la famille des *Pupillidae,* et vers la découverte de genres nouveaux pouvant être joints à cette famille; il ne faut donc pas oublier que c'est

Wiegmann qui doit être, à cet égard, regardé comme l'initiateur proprement dit; il devançait de beaucoup son temps à plusieurs égards.

G. Dallas Hanna, 1912[22]), p. 371—76, commence par une monographie du genre *Sphyradium*, dans laquelle il décrit les parties molles d'une seule espèce: *S. edentulum* Drap. = *Columella e.*, c'est-à-dire, outre l'aspect de l'animal, les organes génitaux, le rein et les glandes salivaires. Les organes génitaux sont figurés (fig. 4).

Il existe 3 travaux de Hesse, dans lesquels sont publiées plusieurs des figures et des descriptions anatomiques posthumes de Wiegmann, à savoir: 1° 1915[25]), p. 55—58, une figure représentant les organes génitaux et la mâchoire de l'*Acanthinula aculeata* Müll., à laquelle est jointe une description des organes génitaux de l'*Helicodonta triaria* Friv. = *Aspasita t.*, examinés par Hesse luimême; 2° 1918[26]), p. 110—119, l'anatomie du *Pyramidula rupestris* Drap., avec figures (copies) de la mâchoire, de la radule, et des organes génitaux (p. 112); 3° 1924[30]), une exposition de la plupart des divers systèmes d'organes des deux espèces d'*Orcula: O. batumensis* Ret. et *O. orientalis* Parr. Sur la planche I se trouve figurés le système des rétracteurs, la mâchoire, la radule, le tube digestif, les organes génitaux et le plafond de la cavité pulmonaire. (L'anatomie du genre *Orcula* est aussi brièvement décrite par A. J. Wagner, 1922[79]), p. 120).

Soós, 1917[62]), a étudié 5 genres différents: *Pupa frumentum* Drap. = *Abida f.*, p. 56, 145; radule (fig. 31), organes génitaux (fig. 32). *Modicella avenacea* Brug. = *Chondrina a.*, p. 58, 145; radule (fig. 33), organes génitaux (fig. 34). *Orcula doliolum* Brug., p. 60, 146; radule (fig. 35), organes génitaux (fig. 36). *Orcula dolium* Drap., p. 62, 146; radule (fig. 37), organes génitaux (fig. 38). *Aspasita triaria* Rossm., p. 64, 147; tube digestif, radule, organes génitaux, et système nerveux (fig. 39, 40, 41 et 42). *Pyramidula rupestris* Drap., p. 114, 160; radule (fig. 88), organes génitaux (fig. 89).

L'auteur de la présente étude, 1917[65]), p. 1—15, a fait une exposition de la structure des organes génitaux chez l'*Acanthinula aculeata* Müll. et chez *A. lamellata* Jeffr. (fig. 1—4), ainsi qu'un aperçu de divers organes intérieurs (organes génitaux, tube digestif, rein) du genre *Vallonia* (fig. 5—7).

De l'Angleterre est venue, pendant les dernières années, une série de recherches sur plusieurs Pulmonés du groupe des *Orthurethra*, ayant pour auteurs deux zoologues distingués, A. E. Boycott et Hugh

Watson. Les travaux concernant la famille des *Pupillidae* sont les suivants: Par Boycott, 1917[12, 13]), une description et une figure de la partie distale des organes génitaux chez l'*Acanthinula aculeata* Müll.[12]), p. 221, et chez l'*A. lamellata* Jeffr.[13]), p. 175; par Hugh Watson, deux excellentes études anatomiques, traitant, en partie de la structure de divers genres, en partie de leurs affinités malacologiques: «The Affinities of *Pyramidula*, *Patulastra*, *Acanthinula*, and *Vallonia*», 1920[80]), et «Masculine Deficiencies in the British Vertigininae», 1923[81]). Dans la première sont étudiés presque tous les organes des genres mentionnés, et il se trouve sur les planches I et II, de même que dans 5 groupes de figures du texte, des reproductions d'une section transversale de la glande pédieuse, du plafond pulmonaire, du système des rétracteurs, du système nerveux, de la radule, des organes génitaux et des spermatozoïdes. La seconde étude s'occupe avant tout du fait particulier que l'organe copulateur mâle fait souvent défaut chez les espèces de la sous-famille *Vertigininae* Pilsb., et l'auteur dresse un tableau sur l'existence et le défaut de pénis chez 8 espèces; mais en même temps il décrit brièvement les organes génitaux des espèces suivantes: *Vertigo moulinsiana* Dup., *V. antivertigo* Drap., *V. substriata* Jeffr., *V. pygmœa* Drap., *V. alpestris* Ald., *V. pusilla* Müll., *Truncatellina britannica* Pilsbr. (peut-être identique au *T. rivierana* Bens., subspec. *britannica* Pilsbr.), et *Columella edentula* Drap.; il donne trois figures schématiques des organes génitaux chez les genres *Vertigo*, *Truncatellina* et *Columella*, mais, à part ces figures, il n'existe pas de reproductions de ces organes. Tous les organes ont été étudiés d'après des coupes, préparées par Boycott.

Nous avons enfin, chez H. Pilsbry[51]), vol. 26, p. 108—09, une courte description des organes génitaux chez le *Pupoides marginatus* Say.

Dans ce qui précède nous n'avons pas mentionné toutes les indications sur la mâchoire et la radule,*) éparses pour la plupart, qui souvent sont jointes à des descriptions purement systématiques des coquilles. Pour des raisons pratiques, elles seront citées dans

*) Dans son travail important et fondamental sur la mâchoire et la radule employées comme base de classement, Mörch, 1865[44]), parle, entre autres, des genres *Pupa*, *Vertigo* et *Vallonia*.

un paragraphe particulier, rangées par ordre systématique (suivant le système de Pilsbry[51]), vol. 24—27), et sous les noms modernes. Si la radule et la mâchoire ont été mentionnées dans les travaux déjà cités, les renvois bibliographiques ne seront pas répétés.

I. Sous-famille **Gastrocoptinae**.

1. Genre *Gastrocopta* Woll.

G. (Albinula) armifera Say, mentionné sous le nom de *Pupa a.* par W. G. Binney, 1883[5]); la radule a été décrite p. 149, d'après l'examen de Saint-Simon.

G. (Vertigopsis) pentodon Say, décrit par Morse, 1864[42]), sous le nom de *Leucochila p.*; mâchoire, p. 36, fig. 85; radule p. 36; pl. 10, fig. 86.

G. (Privatula) corticaria Say, décrit par le même auteur que le *Leucochila c.*[42]); mâchoire, p. 36, fig. 87; radule, p. 37; pl. 10, fig. 88.

G. (Gastrocopta) rupicola Say; la mâchoire et la radule sont brièvement décrites par W. G. Binney, 1878[4]), vol. V, p. 209; figure de la radule, pl. IV, fig. S.

2. Genre *Abida* Leach.

Une description de la radule, s'appliquant à tout le groupe, ainsi qu'une critique des recherches antérieures se trouvent chez H. Pilsbry, 1918[51]), vol. 24, p. 262 et 264. Un assez grand nombre d'espèces ont été examinées par H. M. Gwatkin, 1897[21]), p. 227—228, mais aucune forme n'est figurée.

A. secale Drap., décrit par Lindstrøm, 1868[34]), sous le nom de *Pupa s.*; mâchoire, pl. I, fig. 12; la radule a été mentionnée par Pilsbry[51]), vol. 24, p. 265.

A. frumentum Drap.; la radule est brièvement décrite par Pilsbry, l. c., p. 265.

3. Genre *Granopupa* Boettg.

G. rhodia Roth. L'espèce a été étudiée par Gwatkin, 1897[21]), p. 227, et Pilsbry, 1918[51]), vol. 24, p. 332.

4. Genre *Chondrina* Reich.

Pilsbry, 1918[51]), vol. 25, p. 1—3, donne une exposition de la radule, s'appliquant au genre en général, et critique les recherches faites par Gwatkin[21]), qui a examiné, il est vrai, une quantité

d'espèces (p. 228), mais qui n'a figuré que le *C. megacheilos* Cr. et Jan, sous le nom de *Pupa m.* (fig. II); la figure n'est pas bonne, et ne donne aucune idée des dimensions des plaques basilaires, celles-ci n'étant pas délimitées en arrière.

Schacko, chez Westerlund, 1876[84]), p. 167, a étudié les espèces: *C. megacheilos* Cr. et Jan, *C. avenacea* Brug., *C. spelta* Beck (sous les noms de *Pupa mühlfeldi* Küst., avec var. *ventilatoris* Parr.), *C. goniostoma* Küst. et *C. (Solatopupa) similis* Brug. (sous le nom de *P. quinquidentata* Born), et démontré qu'elles appartiennent toutes au même type.

C. avenacea Brug. a été décrit par Lindström, 1868[34]), sous le nom d'*Alloglossa avenacea* Brug.; mâchoire, p. 18, pl. I, fig. 11; radule, p. 16, 18, pl. I, fig. 13.

C. (Solatopupa) similis Brug. La mâchoire et la radule de cette espèce ont été décrites par Fr. Wiegmann, 1901[87]), p. 12, sous le nom de *Pupa quinqued(ent)ata* Born, et figurées par Pollonera, 1887[52]), pl. IV, fig. 16, sous le nom de *Torquilla cinerea* Born. (Dans le premier de ces travaux se trouvent quelques lignes sur le rein et sur le système nerveux central de la même espèce).

II. Sous-famille **Vertigininae**.

1. Genre *Vertigo* Müll.

Vertigo ovata Say (sous le nom d'*Isthmia o.*), Morse, 1864[42]), p. 38; mâchoire, fig. 93; radule, pl. 10, fig. 94.

V. gouldii Binn. (comme *Isthmia Gouldii*), Morse, 1864[42]), p. 38; mâchoire, fig. 95; radule, pl. 10, fig. 96.

V. bollesiana Morse (comme *Isthmia Bollesiana*), Morse, 1865[43]), p. 209: radule et mâchoire.

V. ventricosa Morse (sous le nom d'*Isthmia ventricosa*), chez Morse, 1865[43]): radule et mâchoire; et chez Tomlin et Bowell, 1909[76]), p. 297—98; pl. 5: radule. Les espèces ci-dessus mentionnées ont été en outre*) décrites et figurées par W. G. Binney, 1878[4]), vol. V, et par Binney et Bland, 1869[8]), vol. I.

V. perryi Sterki, 1905[69]), p. 54; description de la mâchoire et de la radule.

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*) Les copies n'ont été citées que dans des cas spéciaux; dans le cas susmentionné, parce que les travaux de Morse sont difficilement accessibles.

V. oscariana Sterki, 1890[66]), p. 34; description de la mâchoire et de la radule.

V. moulinsiana Dup., description et figure de la radule chez Heynemann, 1862[31]) (sous le nom de *V. ventrosa* n. sp.), p. 12—13; pl. I, fig. 8; chez Tomlin et Bowell, 1909[76]), p. 297—98, pl. 5.

V. lilljeborgi Westld.; description et figure de la radule chez Tomlin et Bowell, l. c.

V. antivertigo Drap.; mâchoire et radule décrites par Saint-Simon, 1876[53]), p. 175—176.

V. pusilla Müll. et *V. angustior* Jeffr.; mâchoire et radule, ibidem, p. 174—175.

2. Genre *Columella* Westl.*)

C. edentula Drap. La mâchoire et la radule ont été décrites par Saint-Simon, 1878[54]), p. 214—216, sous le nom de *Vertigo e.*, et par V. Sterki, sous le nom de *Sphyradium e.*, 1896[68]), p. 75—76; la radule a été figurée par Gwatkin, 1897[21]), p. 227, fig. I.

3. Genre *Pupisoma* Stol.

Un diagnostic général de la mâchoire et de la radule a été donné par Pilsbry, 1920[51]), vol. 26, p. 19.

P. dioscoricola C. B. Ad.; sous la désignation: «Helix—», Costa Rica, la radule a été décrite et figurée par Binney, 1883[6]), p. 113; pl. V, fig. L. Plus tard, en 1890[7]), la mâchoire a été décrite et figurée par le même auteur (sous le nom de *Microphysa* (?) *d.*, p. 197; pl. III, fig. 6), ainsi que la radule (pl. II, fig. 5). Suter a d'ailleurs, sous le nom de *Thysanophora caeca* Guppy, décrit la mâchoire et la radule, 1900[73]), p. 336, et il les a figurées toutes deux (pl. III, fig. 2 et 3).

P. miccyla Bens. Mâchoire et radule décrites et figurées par Godwin-Austen, 1910[18]), vol. II, p. 302; pl. 132, fig. 1 c (radule) et fig. 1 d (mâchoire); on y trouve aussi des indications sur l'aspect général de l'animal.

P. longstaffi God.-Aust. Dans le travail susmentionné, indications sur la mâchoire et la radule[18]), p. 304; figure de la radule, pl. 132, fig. 3 b.

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* La place du genre n'a pas été indiquée chez Pilsbry.

4. Genre *Truncatellina* Lowe.*)

T. cylindrica Fér. — Saint-Simon, 1876[53]), décrit, sous le nom de *Vertigo muscorum* Drap., la mâchoire et la radule (p. 173), et Wiegmann, 1876[85]), p. 232, donne les mesures de la mâchoire. (L'espèce est appelée par lui *Pupa minutissima* Hartm.)

III. Sous-famille Pupillinae.

1. Genre *Pupoides* Pf.

P. coenopictus Hutton. La mâchoire et la radule de cette espèce ont été décrites par C. F. Jickeli, 1874[32]), p. 101, 103, sous le nom de *Buliminus (Napaeus) fallax* Say [identification d'après Pilsbry[51]), vol. 26, p. 123]; mâchoire, pl. II, fig. 1, K; radule, pl. II, fig. 1.

P. marginatus Say. Mentionné par Binney, 1878[4]), sous le nom de *Pupa (Leucochila) fallax* Say. Dans le vol. V, p. 204, se trouvent décrites la mâchoire et la radule, et sur la pl. IV, fig. T, est donnée une figure de la radule.

2. Genre *Pupilla* Leach.

P. muscorum L. La mâchoire et la radule de cette espèce extrêmement répandue ont déjà été décrites et figurées par Morse, 1864[42]), p. 37, sous le nom de *Pupa badia* Adams. Figures de la mâchoire, fig. 91 du texte, et de la radule, pl. 10, fig. 92. Wiegmann, 1876[85]), a indiqué, pour la même espèce, les mesures de la mâchoire (p. 232), ainsi que les mesures et le nombre des dents radulaires chez les petits (p. 212). G. Schacko, 1874[35]), p. 24, a donné la formule dentaire, et Steenberg a décrit enfin en 1911[63]), p. 172, la mâchoire et la radule, et en a donné des figures (mâchoire, fig. 142; radule, fig. 143).

Pupilla signata Mouss. E. v. Martens, 1874[35]), parle de cette espèce sous le nom de *Pupa cristata* Mart., et dans le même ouvrage Schacko en décrit et figure la mâchoire et la radule (p. 24; pl. III, fig. 40).

IV. Sous-famille Orculinae.

1. Genre *Orcula* Held.

O. dolium Drap. La radule a été décrite et figurée par Gwatkin, 1897[21]), p. 227, fig. III.

*) La présente étude était déjà sous presse, quand j'ai reçu le travail de Niels Hj. Odhner, 1924[46]), dans lequel il décrit et figure la mâchoire du *T uncatellina sundleri* n. sp. et la radule des espèces suivantes: *T. sundleri*, *T. costulata*, *T. cylindrica* et *T. monodon* (p. 2—4, fig. 4—8).

2. Genre *Lauria* Gray.

L. bruguierei Jick. (décrit sous le nom de *Pupa Bruguièrei*) et *L. cylindracea* Da Costa (décrit sous le nom de *Pupa umbilicata* Drap.). La mâchoire et la radule des deux espèces ont été décrites et comparées entre elles par C. F. Jickeli, 1874[32]), p. 114, la radule de la dernière espèce par John W. Taylor[74]), vol. I, p. 255, fig. 510.

V. Sous-famille **Acanthinulinae.**

1. Genre *Acanthinula* Beck.

A. aculeata Müll. Radule: description et figure chez Bowell, 1914[11]), p. 158—159.

A. lamellata Jeffr. Radule décrite dans le travail déjà cité.

A. (Zoogenetes) harpa Say. Mâchoire et radule décrites par Morse, 1864[42]), p. 35—36; mâchoire figurée pl. 1, fig. 13; radule, fig. 10—12.

Genres apparentés qui, dans les dernières années, ont été classés dans la famille des *Pupillidae*:

Genre *Vallonia* Risso.

Il existe, dans la littérature malacologique, un assez grand nombre de recherches sur la mâchoire et la radule des diverses espèces appartenant à ce genre: partie des descriptions et des figures isolées, partie une exposition d'ensemble par Sterki, 1893[67]).

Vallonia pulchella Müll. — Sterki[67]); mâchoire, pl. VIII, fig. H, I, K, L; radule, fig. A, G; descriptions, p. 247. — Taylor[74]), vol. 1; mâchoire, p. 253, fig. 507, et p. 254, fig. 508.

V. excentrica Sterki. — Sterki[67]); mâchoire, pl. VIII, fig. M.; radule, fig. B; description, p. 252. — Bowell, 1914[11]), p. 157 et 158; description et figure de la radule. — Morse, 1864[42]), p. 21, décrit et figure la mâchoire, fig. 56, et la radule, pl. 8, fig. 57, du *Vallonia minuta* Say, auquel se rattachent, selon Sterki, le *V. pulchella* ainsi que le *V. excentrica.*

V. costata Müll. — Sterki[67]); mâchoire, pl. VIII, fig. N; radule, fig. C; description, p. 260. — Bowell, 1914[11]), p. 157 et 158; description et figure de la radule.

V. cyclophorella Anc. — Sterki[67]; radule, pl. VIII, fig. E; description de la mâchoire et de la radule, p. 273.

V. albula Sterki. — Sterki[67]; mâchoire, pl. VIII, fig. O; radule, fig. D; description des deux, p. 263 et 264.

V. parvula Sterki. — Sterki[67]; mâchoire, pl. VIII, fig. R.; dent rachiale, fig. P; description de la mâchoire et de la radule, p. 265.

V. perspectiva Sterki. — Sterki[67]; radule, pl. VIII, fig. F; description de la mâchoire et de la radule, p. 271.

Genre *Pyramidula* Fitz.

P. rupestris Drap. La mâchoire et la radule ont été figurées par Pollonera, 1887[52], pl. IV, fig. 14 et 15, la radule par Pilsbry, 1894[51], vol. 9, pl. 11, fig. 25. — Taylor, 1909[74], vol. III, décrit et figure la mâchoire, p. 171, fig. 226; suivant l'opinion de Bowell, au contraire, sa figure de la radule (fig. 227) n'appartient pas à cette espèce. Bowell en donne donc lui-même des figures, 1914[11], p. 160, et 1915[10], p. 290—291.

Genre *Patulastra* Pfeiff.

P. balmei P. & M. Remarque sur la radule chez Pilsbry[51], vol. 9, p. 47, sous le nom de *Pyramidula (Gonyodiscus) balmei.*

Recherches personelles.

Les espèces suivantes ont été examinées: *Chondrina (Solatopupa) similis* Brug. (= *Torquilla quinquedentata* Born = *T. cinerea* Drap.) avec la variété *achinolfi* Settepassi. *C. avenacea* Brug. *Abida partioti* Moq.-Tand. *A. secale* Drap. *A. frumentum* Drap. *Sandahlia cylindrica* Mich. *Orcula dolium* Drap. *Lauria cylindracea* Da Costa (= *Pupa umbilicata* Drap.). *Pupilla muscorum* L. *P. triplicata* Stud. *P. bigranata* Rossm. *P. cupa* Jan (et *f. sterri* Voith). *P. madida* Gredl. *Vertigo moulinsiana* Dup. *V. pygmæa* Drap. *V. antivertigo* Drap. *V. substriata* Jeffr. *V. pusilla* Müll. *V. angustior* Jeffr. *Nesopupa moreleti* Brown. *Truncatellina rivierana* Bens. (= *Isthmia r.*). *T. costulata* Nilss. (= *Isthmia c.*). *T. cylindrica* Fér. (= *Isthmia minutissima* Hartm.). *Columella edentula* Drap. (= *Sphyradium*

edentulum Drap.). *Zoogenetes harpa* Say (= *Acanthinula harpa* Say).

Autrefois l'auteur a examiné: *Acanthinula aculeata* Müll. *A. (Spermodea) lamellata* Jeffr. *Vallonia costata* Müll.

Organes génitaux.

Dans tous les examens systématiques où la coquille ne donne pas de renseignements certains sur l'affinité des formes, la structure des organes génitaux peut servir en général de critérium important. Ceci est surtout le cas dans l'étude des genres et des espèces; cependant, dans plusieurs rencontres, les organes génitaux peuvent aider aussi à la distinction des groupes plus grands. Autrefois la mâchoire et la radule étaient surtout prises comme base pour les études systématiques plutôt que les organes génitaux, ce qui était dû au fait qu'elles sont plus faciles à préparer; mais leur valeur pour la systématique est souvent inférieure à celle des organes mentionnés, étant donné qu'elles sont extrêmement influencées par les conditions extérieures, et avant tout, naturellement, par le genre de nourriture et par l'habitat. Dans beaucoup de cas la coquille et les organes génitaux sont seuls en mesure de donner des caractéristiques certains d'espèces; la famille des *Pupillidae* en offre plusieurs exemples. A cause de la grande importance des organes génitaux, ceux-ci seront l'objet d'une description beaucoup plus détaillée que celle de tous les autres organes.

Avant de commencer l'étude de chaque espèce, nous donnerons une exposition des organes génitaux en général. La nomenclature des diverses parties de ces organes ayant beaucoup varié dans le cours des années, nous allons rendre compte en même temps de la dénomination de chaque partie.

La glande hermaphrodite *(glandula hermaphroditica*; fig. 1 du texte; pl. II, fig. 1, *gh)* se trouve enchassée dans le foie supérieur; elle se compose de courts tubes ou follicules glandulaires *(acini)*, dont l'aspect varie pour les différents genres et les différentes espèces. Comme c'est l'ordinaire chez les Pulmonés, ces tubes produisent à la fois des œufs et des spermatozoïdes. Les produits génitaux passent dans un long conduit excréteur, le canal herma-

phrodite *(ductus hermaphroditicus*; pl. II, fig. 1, *dh)*, situé le long de la columelle et de la région supérieure du muscle columellaire; sa première partie est droite, la dernière très tortueuse ou plutôt repliée en zigzags. Après avoir atteint la glande albuminipare, cette dernière partie débouche dans l'extrémité supérieure d'un tube cylindrique: «la poche de fécondation» *(vesicula seminalis*; pl. II, fig. 1, *pf*; Meisenheimer, 1907[37]), p. 494, et 1912[38]), p. 86 et 112), qu'elle a d'abord longée parallèlement sur une certaine longueur. C'est dans cette poche que s'opère la fécondation, s'il en est de même ici que chez l'*Helix* (Meisenheimer). La poche de fécondation se continue directement dans une gouttière: le canal séminal *(canalis seminalis;* fig. 14 A; pl. X, 1,. *cs)*. Sa région inférieure est dilatée (pl. XXVIII, fig. 1, 2, *am*), et sur un des côtés de cette dilatation s'aperçoit une longue fente (pl. XXVIII, fig. 2, *ft*), qui sert de passage aux œufs allant de la poche de fécondation à l'oviducte. Par une fente étroite dans la paroi du canal séminal, l'oviducte est en communication avec ce dernier (fig. 2 du texte). C'est cette partie, formée par les conduits excréteurs mâle et femelle réunis, qui s'appelle le spermoviducte. La section femelle de celui-ci (pl. II, fig. 1, *ov*) est fortement renflée et munie, principalement dans sa partie supérieure (pl. II, fig. 1, *a—f*), de plusieurs plis creux transversaux, sur le côté extérieur, opposé à la columelle. L'extrémité supérieure, appelée «la chambre de l'albumine» (pl. XXVIII, fig. 2, *ch*), où s'ouvre la «fente des œufs» *(ft)*, a subi un développement particulier. C'est dans cette chambre que se déverse (par ×) l'albumine provenant de la grande glande albuminipare (pl. II, fig. 1, *ga*), et que l'œuf s'enveloppe de la couche d'albumine et de la coque, ou du moins d'une partie de cette dernière. Nous avons donc ici un ensemble analogue à celui qui a été décrit pour les Clausilies (C. M. Steenberg, 1914[64]), p. 14—16, fig. 7).

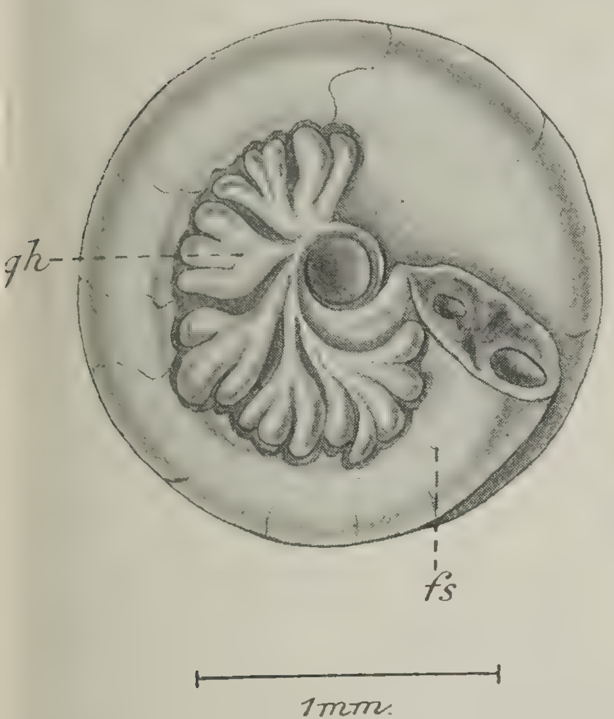


Fig. 1. *Abida partioti* Moq. Position naturelle de la glande hermaphrodite *(gh)* enchâssée dans le foie supérieur *(fs)*.

La section mâle du spermoviducte, ainsi que la femelle, renferment une quantité très considérable de glandes, mais tandis que les cellules glandulaires de l'oviducte sont logées dans les parois mêmes, celles du canal séminal sont situées en dehors de la paroi, formant un organe particulier: la prostate (pl. I, II, fig. 1, *pr*), qui se distingue assez nettement du spermoviducte même. Elle se compose de tubes qui débouche chacun dans le canal séminal. Chez certains genres *(Chondrina, Abida, Sandahlia* et *Orcula)* la prostate constitue une bande allongée et assez large, s'étendant le long du canal séminal, dans presque toute la longueur de celui-ci, chez les *Lauria* et surtout chez les *Pupilla* elle ne s'est développée que le long de la région supérieure du spermoviducte, et chez les *Vertigo* et les *Acanthinula* enfin, elle ne consiste qu'en quelques follicules courts, situés à la naissance du canal séminal. Chez les *Truncatellina* et les *Columella* il n'est pas possible de constater l'existence d'une prostate proprement dite; il faut que les cellules glandulaires soient uniquement logées dans la paroi du canal séminal.

La position des différentes parties du spermoviducte est comme suit: l'oviducte (pl. I, *ov*) est tourné en dehors, vers la face libre du tour qui le renferme, et un peu vers le bas; la prostate (pl. I, *pr*) se trouve en haut vers la paroi de la coquille qui forme la limite entre le tour mentionné et celui du dessus; le canal séminal enfin court le long du côté columellaire.

A l'extrémité inférieure du spermoviducte le canal séminal se ferme en un tube: le canal déférent *(vas deferens*; pl. II, fig. 1, *vd)*; l'oviducte se rétrécit sensiblement et se continue en un conduit, souvent cylindrique, jusqu'au lieu où il se joint au pénis. A michemin à peu près part un tube très long, se terminant par une vésicule et appelé «la poche copulatrice» *(receptaculum seminis*; pl. II, fig. 1, *rs)*; la partie inférieure (pl. II, fig. 1, pd_1) de ce tube: le pédoncule de la vésicule ou de la poche copulatrice (pl. II, fig. 1, *pd*), est souvent si élargie qu'elle semble être la continuation directe de la partie distale du conduit excréteur femelle: le vagin *(vagina*; pl. I et II, fig. 1, *va)*. Sur le pédoncule se trouve, chez certains genres, un diverticule (*Pupilla*, pl. X, *di*; *Acanthinula*, pl. XXVIII, fig. 4 et 5). Le pédoncule monte le long de l'oviducte, et souvent à tel point que la vésicule touche à la glande albuminipare. La partie entre le lieu de naissance de la poche copulatrice

et celui du canal déférent s'appelle «l'oviducte libre» («Uterushals» chez Wiegmann; pl. II, fig. 1, *ol*). Quelques genres *(Lauria, Pupilla*, la section *Zoogenetes* du genre *Acanthinula)* étant ovovivipares, la section femelle du spermoviducte, ou quelquefois la partie supérieure de l'oviducte libre, dans laquelle se développent les embryons, est fortement dilatée et la paroi en est extrêmement mince. Dans ce cas cette région est nommée «uterus» (pl. IX, X, *ut*).

Avant de passer à la description de l'organe copulateur mâle, nous ferons observer un phénomène particulier de structure, s'apercevant chez plusieurs genres de la famille des *Pupillidae*. Chez la famille des *Helicidae* et probablement chez plusieurs autres familles, la section femelle du spermoviducte n'est constituée que par un seul canal (voir Meisenheimer, 1912[38]), fig. 45, p. 87). Chez le genre *Buliminus (Ena)*, d'après Beck, 1912[2]), et chez la famille des *Clausiliidae*, d'après Steenberg, 1914[64]), la partie supérieure de l'oviducte libre et le conduit femelle du spermoviducte sont divisés en deux sections, par un pli longitudinal fortement saillant, dans le bord libre duquel se trouve creusé le canal séminal. Chez les Clausilies, où l'auteur a minutieusement étudié les détails, ce pli saillant atteint la paroi opposée, sans y être pourtant soudé, et il se produit de cette manière, en tout cas dans la région supérieure de l'oviducte libre, une séparation, complète en pratique, entre les deux conduits. Leur structure histologique est extrêmement différente; dans l'un deux, appelé «canal séreux», la paroi renferme de nombreuses cellules glandulaires séreuses, dans l'autre, «le canal muqueux», qui présente la structure ordinaire d'un oviducte, les parois contiennent des cellules glandulaires muqueuses. Entre ces deux se trouve, comme un 3e petit conduit, le canal séminal. Vers le haut du spermoviducte, le canal séreux se rétrécit de plus en plus, tandis que le muqueux s'élargit considérablement, contrairement à ce qui se voit dans l'oviducte libre. Pour plus de détails nous renvoyons à la figure 6 et à la planche[64]).

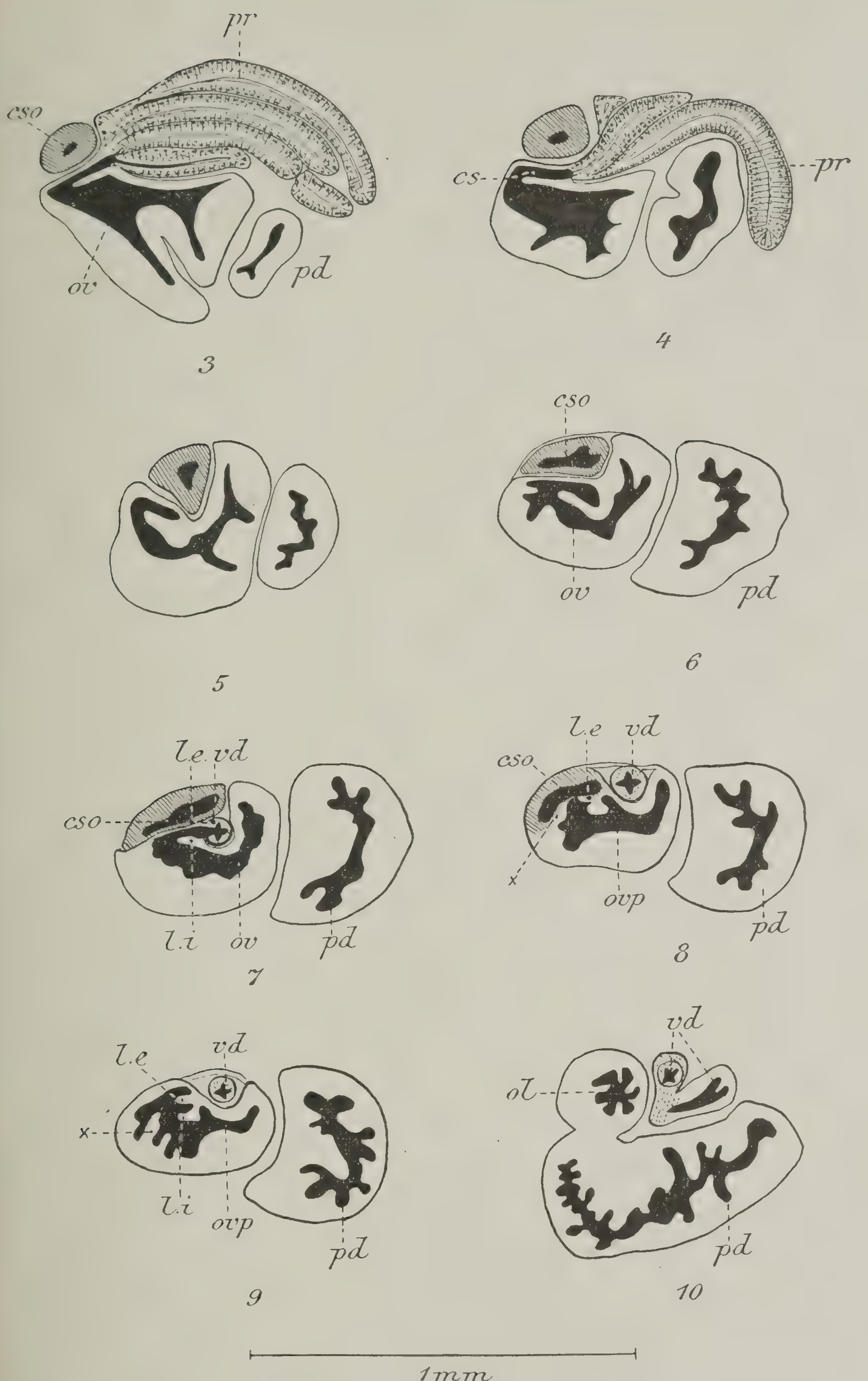
Chez l'*Abida frumentum* Drap. (fig. 2 du texte), l'oviducte est également divisé en deux, mais la séparation des deux conduits *(cso* et *ov)* y est complète. En effet, le pli saillant qui, chez les *Clausilia*, se constate dans l'oviducte libre et qui atteint la paroi opposée, y est soudé dans cette première espèce (fig. 2, *l.e*). Comme

nous l'avons exposé ci-dessus, le canal séminal se trouve, chez les *Clausilia*, creusé dans le bord libre du pli saillant et limité par deux lames en forme de lèvres; il faut supposer que l'une de ces lames seulement *(l.e)* est soudée à la paroi opposée; l'autre *(l.i)* fait encore saillie, avec son bord libre, dans le canal muqueux,

Fig. 2. Section transversale du spermoviducte et du pédoncule de la poche copulatrice chez *Abida frumentum* Drap. La figure correspond à celle du numéro 6, plus schématique. — *cso*, cul-de-sac de l'oviducte; *l.e*, lèvre extérieure du canal séminal; *l.i*, lèvre intérieure; entre les deux se trouve le canal séminal garni de cils vibratils; *ov*, oviducte proprement dit; *pd*, pédoncule de la poche copulatrice.

qu'elle ne sépare qu'incomplètement du canal séminal. Les figures 3—10 du texte montrent, en sections transversales, la structure de l'oviducte libre et du spermoviducte (ainsi que de la poche copulatrice) chez l'*Abida frumentum* Drap.

Dans la figure principale (fig. 14 A du texte) se trouve indiqué comment sont menées les diverses coupes. La figure 10 montre le développement vigoureux de la partie inférieure du pédoncule de la poche copulatrice *(pd)*, par rapport à la région inférieure de l'oviducte libre *(ol)*. Les deux organes sont garnis, à l'intérieur, de plis saillants. Dans l'oviducte libre, deux de ces plis se rap-



Figures 3—10. Sections transversales du spermoviducte, de l'oviducte libre et du pédoncule de la poche copulatrice chez *Abida frumentum* Drap., vues par dessous (de la partie distale). Sur la figure 14, A est montré comment sont menées ces sections; voir d'ailleurs le texte. — *cs*, canal séminal; *cso*, cul-de-sac de l'oviducte; *l.e*, lèvre extérieure du canal séminal; *l.i*, lèvre intérieure; *ol*, oviducte libre; *ov*, oviducte proprement dit; *ovp*. section de l'oviducte libre qui se continue dans ce dernier; *pd*, pédoncule de la poche copulatrice; *pr*, prostate; *vd*, canal déférent; ×, lamelle dans l'oviducte libre.

prochent l'un de l'autre (fig. 9, *l.e* et X), se touchent (fig. 8), et se confondent (fig. 7); sur la coupe correspondante à la fig. 8, la dissemblance de structure entre les parois des deux canaux formés de cette manière, est déjà nettement accusée; pour marquer cette différence dans la figure, l'un des canaux (l'oviducte lui-même; *ov*, *ovp*) est laissé en blanc, tandis que l'autre — que nous appellerons «cul-de-sac de l'oviducte» *(cso)* — est hachuré. La cloison entre les conduits se dédouble, avec une différence visible dans la conformation des deux lames, tournées chacune vers son canal respectif (fig. 7 et fig. 2). Le canal déférent *(vd)* débouche dans le canal séminal, ou plutôt il en part (fig. 7); un peu plus vers le bas (fig. 8) il s'est déjà logé dans une sinuosité sur la limite entre les deux conduits. Dans toute la longueur du spermoviducte (fig. 7—3), la séparation des deux canaux est complète; cependant, ils sont contigus et reliés par un tissu conjonctif, quelquefois même par des fibres musculaires (qui ne sont pas dessinées dans les fig. 3—10, un peu schématisées); l'un des conduits (celui qui répond au canal séreux des Clausilies) se rétrécit de plus en plus vers la limite supérieure du spermoviducte (fig. 3, *cso*); il se termine enfin en cul-de-sac, un peu avant la base de la glande albuminipare; l'autre, correspondant au canal muqueux des Clausilies *(ov)*, représente, comme chez cette famille, l'oviducte actif.

Le canal séminal est, à l'intérieur, revêtu d'un épithélium cylindrique, garni de cils vibratils.

On ignore à quoi sert le canal étroit et fermé en haut du spermoviducte, appelé: «cul-de-sac de l'oviducte» *(cso)*. Que l'opinion émise ci-dessus, suivant laquelle c'est la lèvre externe du canal séminal qui est soudée à la paroi opposée, ou à un pli de cette paroi, soit juste, c'est ce que prouve une série de coupes des organes génitaux du *Chondrina similis*. Chez cette espèce la réunion du canal séminal et du canal déférent a lieu un peu plus bas (du côté distal) que chez l'*Abida frumentum*; dans un certain parcours l'oviducte libre est, par conséquent, tout à fait comme chez les Clausilies, incomplètement divisé en deux canaux par la lame saillante, dans le bord libre de laquelle se trouve creusé le canal séminal (fig. 11, *cs*). Plus en haut seulement, l'une des lèvres *(l.e)* se soude à la paroi opposée, d'où résulte une séparation entière des deux canaux *(cso* et *ovp)*.

Chez toutes les espèces étudiées des genres *Abida*, *Sandahlia* et *Chondrina*, le cul-de-sac de l'oviducte est long, chez le genre *Orcula* il est large, en forme de poche. Chez les *Vertigo* et les *Columella* il n'existe plus de cul-de-sac bien accentué, mais chez les deux genres se trouve sur la région supérieure (proximale) de l'oviducte libre un renflement dont la consistance histologique diffère de celle du reste de l'oviducte. Il est très vraisemblable que ce renflement représente un cul-de-sac rudimentaire. Le canal excréteur femelle de l'*Acanthinula* et du *Vallonia* est de structure extrêmement simple, correspondant à peu près à celui de l'*Helix pomatia*.

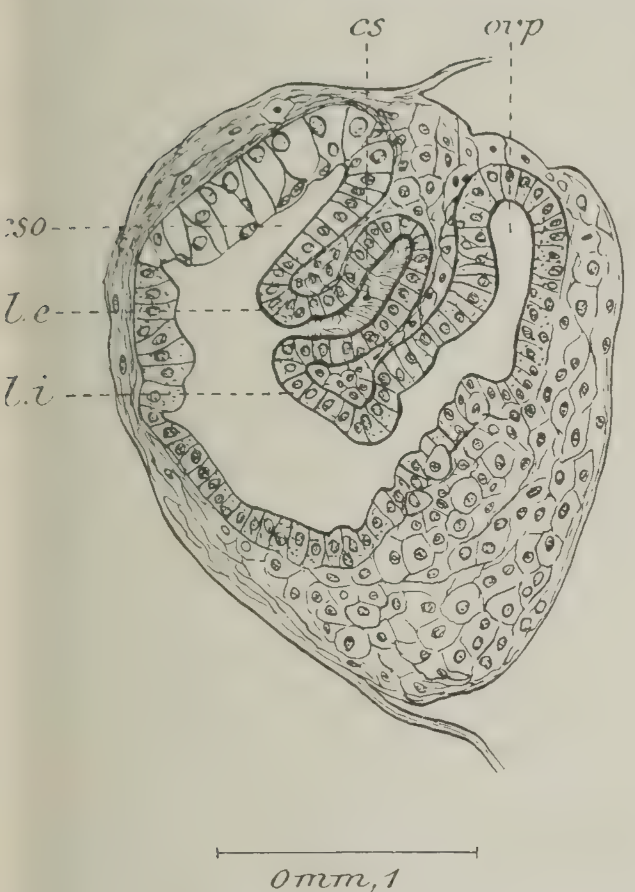


Fig. 11. Section transversale de la région supérieure de l'oviducte libre chez *Chondrina similis* Brug. — *cs*, canal séminal; *cso*, section de l'oviducte libre, qui se continue dans le cul-de-sac de l'oviducte; *l. e*, lèvre extérieure du canal séminal; *l.i*, lèvre intérieure de celui-ci; *ovp*, section de l'oviducte libre, qui se continue dans l'oviducte proprement dit.

Chez les *Lauria* (pl. IX), la structure est assez particulière; c'est l'oviducte libre qui forme seul l'utérus dans lequel sont placés les embryons; le spermoviducte, au contraire, est très petit et présente la même conformation que chez le genre *Clausilia*. Dans un autre genre ovovivipare, le *Pupilla*, la section femelle du spermoviducte est fortement dilatée, à parois minces, et ce genre rappelle beaucoup, par la structure du spermoviducte, le genre *Balea* de la famille des *Clausiliidae* (Steenberg[64]), fig. 9 et 10).

Le vagin et le cloaque génital sont fort simplement construits, sans appendice d'aucune espèce.

Le pénis varie considérablement de forme. Chez quelques genres dont les espèces possèdent un long pénis, celui-ci forme une fronde simple, ou un tube recourbé en angle, dont l'un des côtés se fixe au cloaque génital, tandis que l'autre reçoit, dans son extrémité libre, le canal déférent; au premier de ces côtés, ou à tous les deux, se trouve rattachée l'une des extrémités du rétracteur pénien, tandis que l'autre se fixe au plancher de la cavité

pulmonaire, appelé diaphragme (pl. II, fig. 1, *dp*). Chez d'autres genres, *Orcula, Lauria, Pupilla, Acanthinula* et *Vallonia*, un appendice plus ou moins vigoureux *(appendix*, pl. VIII, 1, *ap)*, ayant le plus souvent une structure assez compliquée, s'est développé sur le pénis, à une certaine distance du cloaque génital. A cet appendice se fixe alors, en général, l'une des branches du rétracteur pénien. A la courbure entre les deux parties du pénis, ou près de cet endroit, se trouve quelquefois (chez certaines espèces des genres *Chondrina* et *Abida*, chez les *Lauria* et les *Pupilla*) un cul-de-sac (pl. II, *fl*), chez l'*Acanthinula aculeata,* deux; quelques auteurs ont comparé cet organe avec le *flagellum* des *Helicidae*, d'autres emploient le nom neutre de *coecum*. La région du pénis située entre cet appendice et le canal déférent, est souvent désignée sous le nom d'*épiphallus.*

Un troisième type de structure pénienne se rencontre dans les *Vertigo* et les *Truncatellina*, où le pénis constitue souvent un tube droit ou légèrement courbé, le rétracteur pénien étant fixé près du lieu d'accès du canal déférent dans le pénis.

Tandis que le vagin et le cloaque génital suivent le côté droit de la paroi du corps (chez les espèces sénestres, le côté gauche), à laquelle ils sont souvent reliés à l'aide de nombreux filaments, le pénis traverse obliquement la nuque, au-dessus de l'œsophage et des glandes salivaires (pl. I, *pé*). Le canal déférent suit un parcours en forme de V, descendant d'abord le long du vagin jusqu'au cloaque génital (auquel il est relié par le filament nerveux qui passe au dessus) et longeant alors la partie basilaire du pénis. Entre les deux branches de ce V, et aussi, par conséquent, entre le pénis et le vagin, court le rétracteur de l'ommatophore (dextre ou sénestre). Il n'a pas été observé de groupes, appartenant à la famille dont nous nous occupons, chez lesquels la partie distale des organes génitaux soit placée librement à côté du rétracteur de l'ommatophore, comme c'est le cas pour certaines sections des familles des *Clausiliidae* et des *Helicidae.*

L'orifice génital se trouve, chez les exemplaires étudiés, sur le côté droit — chez les espèces sénestres, sur le côté gauche — en dessous et un peu en arrière de la base de l'ommatophore; seulement dans les genres *Acanthinula* et *Vallonia* il est placé très en arrière, presque tout à fait sous le pneumostome.

Là où sont employées, dans ce qui suit, les désignations *proximal* et *distal* pour les différentes parties des conduits excréteurs, mâles et femelles, nous n'avons pas tenu compte du développement ni de la position, mais seulement de la direction que suivent les produits génitaux dans leur voie hors du corps, depuis la glande hermaphrodite jusqu'au cloaque génital; *proximal* s'applique donc à ce qui est le plus rapproché de la glande hermaphrodite ou tourné vers celle-ci, *distal* à ce qui est le plus proche du cloaque génital.

Par exemple, la partie du pénis où débouche le canal déférent, est appelée la partie proximale, celle qui est la plus rapprochée du cloaque génital, la distale. Pour les appendices, c'est la partie basilaire qui est caractérisée comme proximale, et la partie apicale, libre, comme distale.

La longueur relative des différentes parties des organes génitaux étant extrêmement variable — surtout dans la portion distale — suivant que l'animal est contracté, entièrement étendu ou seulement à moitié, les mesures absolues de longueur et de largeur des diverses régions ne sont pas indiquées; dans la plupart des cas, elles se trouveront d'ailleurs facilement à l'aide de l'échelle jointe aux figures. Tous les organes génitaux devraient toujours être dessinés d'après des animaux étendus; mais le plus souvent on n'en est pas le maître, soit qu'on reçoive les animaux à l'état conservé, ce qui veut dire souvent à l'état contracté, ou bien qu'il ne soit pas possible de les faire étendre pendant la préparation, malgré tout le soin qu'on y a apporté.

Avant de passer à la description des organes génitaux chez les diverses espèces étudiées, nous ferons remarquer une particularité relative au pénis, observée chez les formes plus petites. Chez quelques espèces le pénis fait toujours défaut, chez d'autres, l'organe copulateur est absent dans une certaine proportion pour cent. Le premier cas est observé dans le genre *Acanthinula*, des individus à pénis n'ayant jamais été rencontrés dans les espèces *A. lamellata* et *A. harpa*. Pour les espèces du second groupe, quelques-unes manquent de pénis dans un grand nombre de cas, tandis que chez d'autres cet organe ne fait défaut que dans un petit nombre pour cent.

Celui qui le premier a fait observer cette particularité, c'est sans doute Wiegmann. Dans un de ses travaux posthumes, daté

d'environ 1870, et publié en 1918 par Hesse[26]), p. 111, Wiegmann s'est prononcé sur le *Pyramidula rupestris* Drap. de la manière suivante: «Merkwürdiger Weise zeigte sich bei allen Tieren der männliche Teil des Geschlechtstractus noch unentwickelt, so dass die Genitalien functionell nur weiblich sein konnten und durch diesen Umstand eine zeitliche Trennung der Geschlechtsfunctionen herbeigeführt war. Ganz ähnliche Verhältnisse habe ich bei der Gattung *Pupa* beobachtet.»

En 1917 Boycott[12]), p. 175, [13]), p. 221, et l'auteur de la présente étude [65]), p. 2, 5, 9, ont observé, indépendamment l'un de l'autre, que les individus adultes de l'*Acanthinula aculeata*, à coquille bien développée, manquaient souvent de pénis, et qu'aucun des nombreux exemplaires étudiés de l'espèce *A. lamellata* ne possédait cet organe; dans le dernier des travaux ci-dessus cités, j'ai démontré en outre que, pour plusieurs individus du *Vallonia costata*, dont la coquille était bien développée, il en était de même que chez l'*Acanthinula aculeata*. Plus tard Watson, 1920[80]), a fait, pour trois espèces du genre *Vallonia (V. costata*, *pulchella* et *excentrica)*, quelques énumérations. Sur 98 exemplaires étudiés, 3 seulement *(V. costata)* présentaient un pénis. Le même auteur a constaté en 1923[81]), p. 276, des cas analogues chez plusieurs espèces du *Vertigo* et du *Truncatellina britannica*, et il en a dressé le tableau. Dans la présente étude nous avons indiqué pour chaque espèce, si tous les spécimens examinés possédaient un pénis et, dans le cas contraire, la fréquence de son défaut.

Watson[81]), p. 276—78, a comparé les différentes explications données provisoirement à ce phénomène; aucune d'elles n'en fournit cependant une interprétation satisfaisante.

C'est une propriété assez particulière — surtout chez les espèces où le pénis fait toujours défaut — qu'il existe alors une poche copulatrice. Ce fait peut être expliqué de la manière suivante. Selon Meisenheimer[37]), p. 498, il est probable que les spermatozoïdes recueillis dans le canal hermaphrodite et la poche de fécondation de l'animal même ne sont pas aptes à féconder, et qu'ils ne le deviennent qu'en pénétrant dans la poche copulatrice d'un autre individu, où ils sont rendus actifs.

Chez les deux espèces du genre *Acanthinula*, ci-dessus mentionnées, où le pénis manque, il faut que les spermatozoïdes, pour

devenir fécondateurs, se rendent d'abord dans la poche copulatrice de l'individu même, quand ils ne peuvent pas pénétrer dans celle d'un autre individu, et reviennent de là à la poche de fécondation où s'effectue la fécondation; pour cette raison, le réceptacle séminal subsiste, bien qu'aucun accouplement ne s'opère. Etant donné que les animaux renferment, dans la glande hermaphrodite, des produits génitaux tant mâles que femelles, il faut supposer, en effet, que la parthénogenèse est exclue.

Chondrina (Solatopupa) similis Brug.

Pl. I; pl. II, 1, 2; pl. IV, 4—6; fig. 11—12 du texte.

Des organes génitaux appartenant à cette espèce ont été examinés dans l'état d'extension, les uns provenant de la forme typique (pl. I; pl. II, 1, 2 et fig. 11 du texte), les autres de la grande variété *achinolfi* Settepassi (fig. 12 du texte). Les individus de la forme typique ont été recueillis à Villefranche-sur-Mer; les exemplaires de la variété sont envoyés par F. Settepassi; ils proviennent des Alpes Apuanes.

La glande hermaphrodite (pl. II, fig. 1, et fig. 12 du texte, *gh*) est assez compacte; elle n'est divisée qu'en trois lobes peu distincts, contenant chacun une vingtaine d'acini. Les acinis sont allongés, ovales ou piriformes, et finement pigmentés, de manière que la glande prend un aspect grisâtre. La première partie du canal hermaphrodite *(dh)* est assez droite; puis vient une section tortueuse qui, dans sa première moitié, est fortement pigmentée, mais de petit calibre, et dont les lacets ne sont que faiblement courbés, tandis que, dans la seconde moitié, elle est le plus souvent moins pigmentée, mais constituée par de gros replis en zigzag. La dernière partie du canal jusqu'à la glande albuminipare *(ga)* est blanche et droite. La poche de fécondation *(pf)* est très longue; elle traverse, dans le sens de la longueur, entre la moitié et les deux tiers de la glande albuminipare, étant (chez la forme principale) entièrement cachée dans celle-ci, de sorte qu'il faut ouvrir cette glande pour la voir. Dans la fig. 1, pl. II, la poche de fécondation est dessinée à l'aide de lignes interrompues. Après avoir atteint la glande albuminipare, le canal hermaphrodite commence par pénétrer un peu en avant dans celle-ci, sous l'aspect d'une corde blanche, puis il se recourbe brusquement pour longer la

poche de fécondation, en se dirigeant vers la pointe de la glande, jusqu'à la partie supérieure sphérique de la poche, dans laquelle il aboutit. Dans tout ce parcours, le mince conduit blanc est serré contre la poche de fécondation, tellement qu'on ne le remarque pas par un examen superficiel, et le canal hermaphrodite paraît déboucher directement dans la région inférieure de cette poche. La partie de ce canal située dans la glande albuminipare est souvent — mais réellement à tort — supposée appartenir à la poche de fécondation. La poche proprement dite comprend, outre la région supérieure, sphérique, une longue partie cylindrique.

La glande albuminipare *(ga)* est blanchâtre et de structure extrêmement compacte. Sur sa face extérieure se voit un sillon en forme de rainure, destiné à recevoir la grande anse extérieure de l'intestin. Ce dernier se continue jusqu'à la pointe de la glande, qui par là est souvent divisée en deux (pl. II, fig. 1, *ci*); c'est tout ce qui, dans les figures, s'aperçoit de l'emplacement de l'intestin, ces figures étant dessinées du côté columellaire. La glande albuminipare aboutit dans la première partie de l'oviducte, laquelle est d'une conformation particulièrement différenciée.

Le spermoviducte est long, correspondant aux tours nombreux de l'animal; le tiers supérieur de la section femelle (pl. II, fig. 1, *a—f*) est fortement développé et considérablement plus large que la base de la glande albuminipare; les deux tiers inférieurs *(ov)* sont beaucoup plus étroits, à peine à moitié aussi larges que la partie supérieure, et d'une structure assez uniforme. La prostate *(pr)* est étroite aussi dans sa région distale; vers le haut sa dimension augmente et sa structure se complique. Tout le long d'un côté du spermoviducte, principalement à la limite entre l'oviducte et la prostate, se trouve la poche copulatrice.

Tout l'oviducte est plissé. Il commence, dans sa partie distale, par des plis transversaux tout petits, qui, vers le haut, deviennent de plus en plus creux. Un peu au-dessous du réceptacle séminal, la prostate s'élargit et forme une saillie triangulaire, assez forte, tournée vers l'oviducte, qui, à cet endroit, est obligé par suite de se recourber fortement en dehors en forme de V couché. (Dans la figure 1, pl. II, *a*, on ne voit que le côté inférieur du premier angle). Jusqu'à cet endroit, la paroi de l'oviducte est de couleur blanchâtre et de consistance assez ferme; dans tout le reste de

son étendue (partie proximale) son aspect est tout autre. Elle est grisâtre, à moitié transparente, et se gonfle dans l'eau. Les forts plis présentent dans cette partie le parcours suivant: l'oviducte commence par se replier en dedans, à peu près vers la base du réceptacle séminal *(b)*, puis il se dirige vers le haut formant un grand arc qui longe l'un des côtés de la vésicule du réceptacle *(c)*; il redescend alors du même côté *(d)*. Cette anse *(c, d)* a une autre direction que le reste des plis, étant à peu près perpendiculaire sur eux.*) En haut l'oviducte se termine par un pli étroit, recourbé en dedans en forme d'angle aigu *(e,f)*. Le côté supérieur de cet angle se replie sur la face de l'oviducte, opposée au réceptacle séminal, et s'avance si loin qu'il arrive presque à la base de la poche de fécondation. Les plis, les lacets et les sinuosités de la section supérieure de l'oviducte, que nous venons de mentionner, ne représentent que la partie extérieure de celui-ci, près de la surface; ils aboutissent tous dans la partie commune, étroite, de l'oviducte, se trouvant du côté columellaire, le long du canal séminal. La partie de l'oviducte contiguë à la poche de fécondation se rétrécit subitement et ses parois deviennent plus fermes et de couleur blanchâtre («chambre d'albumine»). La prostate *(pr)* est constituée par des lames parallèles, composée chacune de tout petits acini qui débouchent dans le canal séminal.

L'oviducte libre *(ol)* se rétrécit fortement dans sa partie distale. Le vagin *(va)* est un tube droit, cylindrique; il est assez musculeux et de longueur extrêmement différente suivant le degré de contraction. La face intérieure du vagin est, dans la partie distale, à peu près lisse ou n'offre en tout cas que de faibles plis longitudinaux; la partie supérieure devient plissée et ces plis se continuent uniformement dans la région inférieure, extrêmement gonflée, du pédoncule de la poche copulatrice, qui est si fortement développé qu'il produit l'impression d'être la continuation directe du vagin, vers le haut, tandis que le passage à l'oviducte libre n'apparaît que comme une fente longitudinale entre deux plis. Vers la partie supérieure, le pédoncule de la poche copulatrice se ré-

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*) C'est celui-ci qui se voit principalement dans la figure de la variété *achinolfi*; la partie supérieure du spermoviducte étant tournée dans la figure 12 du texte, on la voit de differentes façons sur les deux figures (fig. 12 et pl. II, fig. 1).

trécit; tout en haut, auprès de la partie grisâtre, à demi transparente, de l'oviducte, il s'élargit jusqu'à former une grande vésicule

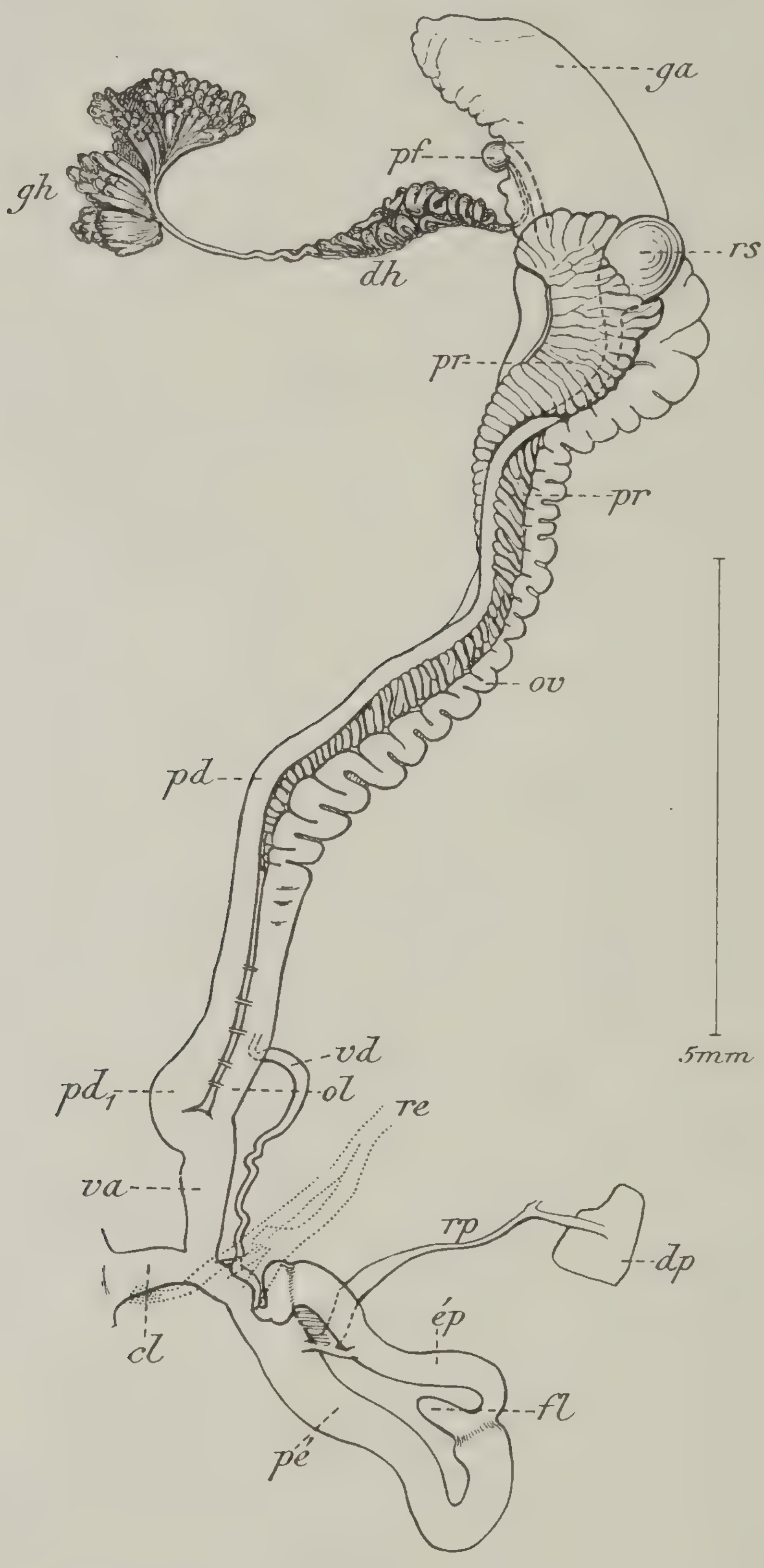


Fig. 12. Organes génitaux de *Chondrina similis*, var. *achinolfi* Sett. — *cl*, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *fl*, flagellum; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ol*, oviducte libre; *ov*, oviducte; *pd*, *pd₁*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *re*, rétracteur externe; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

ovale *(rs)*, à moitié encaissée entre l'oviducte et la prostate. Dans l'intérieur de la partie inférieure du pédoncule se constatent des plis bien accentués (4 chez la variété), qui, plus en haut, sont

remplacés par de nombreux plis crispés et tout à fait bas; la partie supérieure du pédoncule et la vésicule même sont à peu près lisses à l'intérieur, mais cependant avec un aspect finement verruqueux. Chez plusieurs individus il a été observé, dans la vésicule de la poche copulatrice, un spermatophore; celui-ci était en partie dissous et évidemment vidé de spermatozoïdes.

Dans l'extrémité distale de l'oviducte libre, juste au-dessus de l'endroit où prend naissance le pédoncule de la poche copulatrice, s'élève une lame qui tout d'abord est basse, à bord arrondi, mais qui, vers le haut, dans l'oviducte libre, devient plus saillante, et ensuite, par un sillon creusé dans le bord libre, au fond duquel débouche le canal déférent, se divise en deux lamelles (fig. 11 du texte). Nous avons parlé plus haut des autres questions concernant la structure interne de l'oviducte libre et du spermoviducte. Le cul-de-sac de l'oviducte est long et étroit; il s'étend à peu près jusqu'à la glande albuminipare.

Le cloaque génital *(cl)* est bien développé, garni, à l'intérieur, de plis longitudinaux. Le pénis *(pé + ép)* forme une fronde grande et forte, dont la partie distale *(pé)* est spécialement développée et considérablement plus grosse que la section proximale. A l'endroit où il se courbe part un cul-de-sac mince *(flagellum, fl)*, dont la longueur varie un peu. Chez la variété *achinolfi* Settepassi (fig. 12 du texte) il est droit et court, chez la forme typique (fig. 1, pl. II) il est plus long et souvent replié en forme de crochet. La limite entre le canal déférent *(vd)* et le pénis (épiphallus, *ép*) est bien accusée, le premier ne s'ouvrant pas à l'extrémité du pénis (épiphallus) mais sur son côté, un peu avant cette extrémité; le canal déférent est, par conséquent, obligé de se recourber fortement avant de déboucher. Sur la fig. 1, pl. II, le pénis est dans un état d'extension considérable, ce qui n'est pas toujours le cas des exemplaires disséqués, même si les animaux se trouvent dans l'état d'extension. Il se peut bien que la fronde pénienne soit située très en avant dans le corps, et qu'elle soit repliée encore une fois sur elle-même. Cela dépend certainement de l'accumulation du sang dans la cavité du corps. Les parois du pénis sont épaisses et musculeuses. La structure interne de la grosse partie extérieure *(pé)* n'est pas la même dans les deux moitiés. La moitié distale, ou les trois cinquièmes, examinée dans le microscope binoculaire,

paraît à peu près lisse; sur les coupes se voient de nombreuses lamelles fines, qui pourtant sont formées uniquement par l'épithélium, tandis que, dans l'autre moitié, on constate deux forts plis: Sur la face détournée de la partie mince *(ép)* de la fronde (face dorsale) s'élève un pli vigoureux, épais, qui se continue dans le diverticule; un peu plus du côté ventral se trouve un autre pli plus faible, et entre les deux court une gouttière faisant suite à la lumière du diverticule (ou *flagellum*). Outre ces deux plis principaux, cette partie du pénis est garnie de quelques plis longitudinaux, très faibles (pl. IV, fig. 4). La partie proximale, mince, de la fronde pénienne (l'épiphallus, *ép*) porte une lamelle longue et haute, à bord arrondi (pl. IV, fig. 5 et 6).

Le canal déférent (pl. II, fig. 1, *vd*) est fixé à la partie distale du pénis à l'aide de minces fils formant des anneaux. Il monte le long du vagin, décrit, environ à la hauteur de la partie basilaire, dilatée, du pédoncule de la poche copulatrice, une grande courbe, et s'enfonce alors dans la paroi de l'oviducte libre pour la traverser en biais et déboucher au fond du canal séminal. Les parois du canal déférent sont épaisses, musculeuses et brillantes d'un éclat soyeux, surtout dans la partie s'étendant le long de la région moyenne de l'oviducte libre (pl. II, fig. 2).

La musculature du pénis et du cloaque génital est considérablement développée; on peut distinguer deux groupes de muscles: 1° le rétracteur pénien libre *(rp)*; 2° des parties du rétracteur céphalo-pédieux *(retractor externus, re.)* — Le rétracteur pénien libre *(rp)* prend naissance, comme à l'ordinaire, au diaphragme *(dp)*, à peu près vis-à-vis de l'endroit où le canal déférent s'ouvre dans le canal séminal. Dans son parcours, depuis le diaphragme jusqu'au pénis, il a, du côté gauche, l'œsophage et les glandes salivaires, du côté droit, l'oviducte libre (pl. I, *rp*). Près de l'endroit où il se rattache au pénis, le muscle grossit et se divise en deux ramifications. La branche principale (pl. II, fig. 1, rp_1) s'avance jusqu'à la grosse partie du pénis et s'y insère un peu au-dessous du milieu; une branche plus faible (rp_2) retourne en arrière, formant un angle aigu avec la partie du muscle non encore ramifiée, et se rattache à la section mince du pénis, un peu au-dessus du milieu de celle-ci. Une lamelle formée de tissu conjonctif, dans laquelle se trouvent logées 4 fibres musculaires plus longues et une ou deux plus courtes,

relie les deux parties de la fronde pénienne; trois de ces fibres courent en biais entre la section mince du pénis *(ép)* et le rétracteur pénien *(rp_1)*. Les muscles rétracteurs céphalo-pédieux sont, sur une grande étendue, en communication avec les organes génitaux. Le rétracteur de l'ommatophore *(ro)* envoie d'abord, à la partie extérieure du pénis, une bande étroite (formée, dans la figure, de deux fibres musculaires, qui souvent sont plus courtes que celle-ci ne le montre), puis une autre, très courte, mais large, aboutissant en partie à l'endroit où le pénis et le canal déférent se rencontrent, en partie à la région distale du pénis. Dans certains cas, cette bande se divise en plusieurs fibres musculaires (comme le montre la figure 1, pl. II). Toute la partie de la fronde pénienne à laquelle se rattache la bande musculaire dernièrement mentionnée, est entourée, en forme de manchette, par un grand manteau de tissu conjonctif, renfermant de fines fibres musculaires.

La partie formée par les rétracteurs combinés du petit tentacule et du lobe labial se divise en 4 ramifications: 1⁰ une branche allant uniquement à la partie distale du pénis; elle est reliée, à l'aide de tissu conjonctif, à la bande musculaire étroite, ci-dessus mentionnée, qui part du rétracteur de l'ommatophore; 2⁰ une ramification allant au petit tentacule *(rpt)* et envoyant une branche latérale à la partie distale du pénis; 3⁰ une bande musculaire se dirigeant vers le lobe buccal *(rl)*, mais qui, en traversant du côté interne la partie supérieure du cloaque génital, s'y rattache par de courts filaments vigoureux; 4⁰ une bande qui se joint au rétracteur labial, le renforçant de cette manière; elle se fixe d'ailleurs par de courts filaments à la région supérieure du cloaque génital et continue de là le long du cloaque jusqu'à la base de celui-ci, où elle s'insère *(ra)*. Le rétracteur pédieux proprement dit *(rpd)* projette, dans son extrémité antérieure, de fines fibres musculaires à la partie inférieure du cloaque génital.

Le nerf pénien *(np)* est très vigoureux; il constitue nettement une branche latérale partant de la base du nerf labial, médian *(nervus labialis medianus)*, comme chez l'Hélix, et va à la partie extérieure (distale) du pénis, où il se ramifie en forme de T.

La figure de A. Schmidt représentant le *Pupa cinerea* Drap.[56]) (p. 42; pl. X, fig. 82) est, pour l'essentiel, exacte; seulement aucun des individus examinés par moi ne possédait un vagin en même

temps aussi long et aussi gros. La figure de Moquin-Tandon[41]) (pl. 25, fig. 19; description, p. 354, tome II), reproduisant le *Pupa (Torquilla) quinquedentata* Born., n'est pas aussi exacte que celle de Schmidt, quoi qu'on puisse dire qu'il a bien remarqué quelques-unes des qualités les plus caractéristiques.

Chondrina avenacea Brug.

Pl. III, fig. 1 ; fig. 13 du texte.

L'examen a été fait sur des exemplaires étendus, recueillis dans les Pyrénées par Chr. Petersen; juillet 1908.

La glande hermaphrodite *(gh)* se compose de 4—5 faisceaux d'acini, fortement pigmentés aux sommets; le canal hermaphrodite *(dh)* est aussi pigmenté dans sa première section droite, ainsi que dans la section tortueuse; la dernière partie seule, jusqu'à la poche de fécondation, est sans pigment. Cette poche elle-même *(pf)* est blanche chez quelques individus, légèrement pigmentée chez d'autres; elle est courbée en forme de crosse, et n'est pas cachée dans la glande albuminipare *(ga)*. Le long spermoviducte se présente en haut fortement développé, surtout pour ce qui concerne la région de la prostate *(pr)*, qui, vers le bas, se rétrécit considérablement pour se terminer peu à peu en pointe. L'oviducte *(ov)* est relativement peu développé, mais à part cela, il ressemble, pour l'essentiel, à celui de l'espèce précédente; chez les exemplaires disséqués, ses plis supérieurs offraient un caractère particulièrement ferme et fragile.

Le vagin *(va)* est très long. Comme chez l'espèce précédente, le pédoncule de la poche copulatrice paraît, d'après un examen superficiel, être la continuation proprement dite du vagin, la base de ce pédoncule pouvant atteindre, chez quelques spécimens, jusqu'à 3 ou 4 fois la grosseur de la partie inférieure de l'oviducte libre *(ol)*. La vésicule de la poche copulatrice *(rs)* est très allongée et pas nettement distincte du pédoncule *(pd)*, qui est à peine deux fois plus long que la vésicule. Le vagin présente, à l'intérieur, plusieurs plis longitudinaux plus ou moins réguliers. Le pédoncule de la poche copulatrice est d'une conformation interne semblable; il porte 5—6 plis longitudinaux bien accentués, mais irréguliers, tandis que la vésicule est uniformément garnie de fines verrues. Pour

ce qui concerne la structure intérieure de l'oviducte libre, elle est, pour les points essentiels, conforme à celle de l'espèce précédente. Le cul-de-sac de l'oviducte, qui, au début, est tout petit, s'élargit peu à peu vers le haut, et prend, à l'endroit où la prostate est toute développée, une dimension considérable; les préparations de coupes montrent qu'il est situé entre la prostate et le muscle columellaire et touche au canal séminal. Déjà dans la partie inférieure, les cellules épithéliales du canal fournissent une sécrétion abondante, leur extrémité étant remplie de nombreux granules qui se colorent fortement d'orange. Dans la partie supérieure, dilatée, paraissent, parmi les cellules séreuses, une quantité de grandes cellules claires.

Le cloaque génital *(cl)* est très court; il est, intérieurement, garni de faibles plis longitudinaux. Le pénis *(pé)* est de structure toute simple, sans flagellum. Il forme une fronde, dont la partie reliée au cloaque génital, est plus longue et plus grosse que l'autre, dans laquelle aboutit le canal déférent. Les parois sont épaisses et musculeuses. La structure du pénis varie beaucoup suivant les différentes parties: A une certaine distance du lieu d'accès dans le cloaque génital commencent deux plis inégaux, qui se dirigent vers celui-ci en s'élevant de plus en plus; tout près du cloaque génital ces plis se joignent, constituant une saillie en forme de langue ou plutôt de cuiller, qui s'avance légèrement dans la région supérieure du cloaque. Plus vers le haut, le pénis est garni de fines lamelles longitudinales, et, au point d'attache du rétracteur, de 3—4 plis longitudinaux un peu plus forts, entre lesquels se voient de fines rides transversales. La partie du pénis située entre l'attache du rétracteur et la courbure de la fronde pénienne, possède des parois plus minces que celles de la section que nous venons de décrire. La face interne est ici irrégulière, ce qui est dû à la présence d'un grand nombre de rides transversales très fines. Vers l'endroit où la fronde se recourbe, s'élève sur l'un des côtés latéraux (celui qui est tourné vers la moitié proximale de la fronde pénienne) un bourrelet longitudinal très fort, muni de nombreuses lamelles transversales, serrées. Immédiatement avant la courbure apparaissent en outre 3—4 plis plus petits, dont les 3 se prolongent dans la plus grande partie de la région proximale du pénis, tandis que le grand bourrelet disparaît. Ces trois plis, à

coupe transversale triangulaire, portent sur les côtés de nombreuses lamelles transversales (tout à fait comme chez l'*Abida secale*, pl. XXXIV, fig. 3). Dans la partie autour du lieu d'accès du canal déférent ne s'observe que le pli du milieu, qui se présente alors sous une forme plus simple; le reste de la paroi est couvert de fines rugosités et de légères rides transversales.

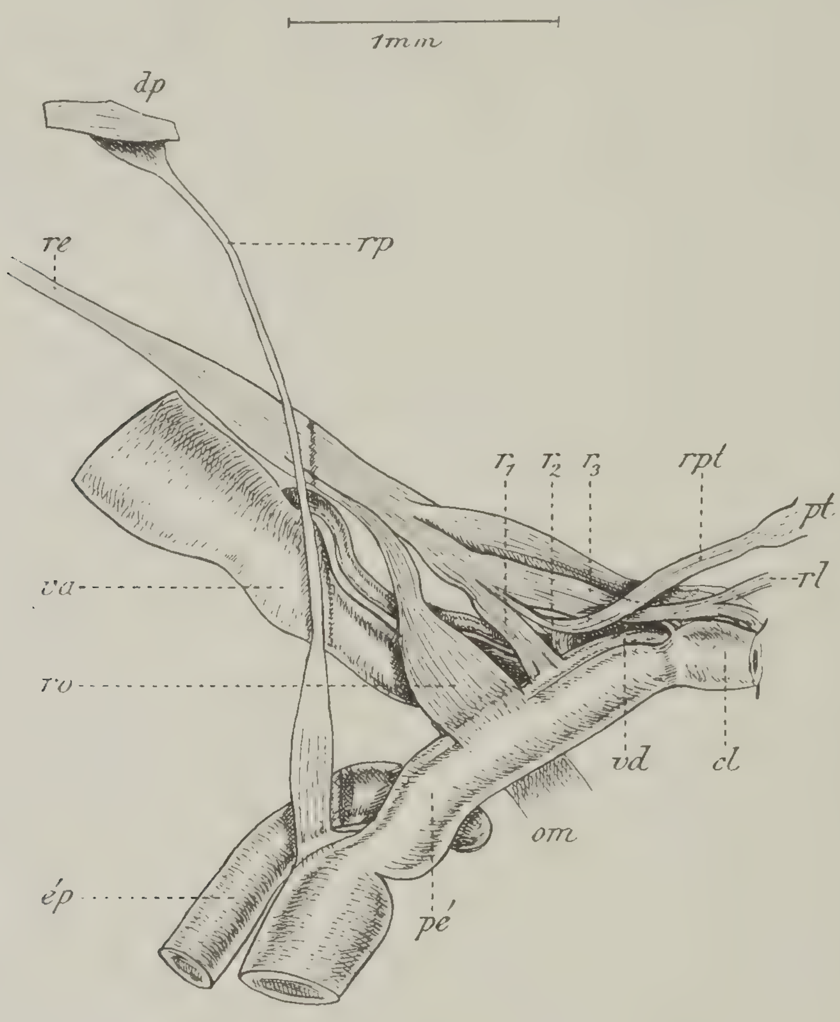


Fig. 13. Musculature pénienne de *Chondrina avenacea* Brug; le pénis a été tourné vers le côté droit de l'animal. — *cl*, cloaque génital; *dp*, diaphragme; *ép*, épiphallus; *om*, ommatophore; *pé*, pénis; *pt*, petit tentacule; r_1, r_2, r_3, les trois branches musculaires allant au canal déférent et au pénis, au petit tentacule, et au lobe labial; *re*, «retractor externus»; *rl*, rétracteur labial; *ro*, rétracteur de l'ommatophore; *rp*, rétracteur pénien; *rpt*, rétracteur du petit tentacule; *va*, vagin; *vd*, canal déférent.

Musculature de la partie distale des voies génitales (fig. 13 du texte): Le grand rétracteur pénien libre *(rp)* se rattache au diaphragme *(dp)* assez loin en arrière. Il court sur une grande étendue parallèlement au rétracteur externe gauche, mais à part cela, il a le même parcours que chez le *C. similis*; en avant, vers le pénis, il est excessivement gros et «charnu», le reste est d'un aspect plus tendineux. L'attache au pénis est simple, mais extrêmement puissante. Le muscle ne va que jusqu'à la partie grosse de la fronde pénienne, où il s'insère à peu près sur le milieu, et non

pas à la partie mince. La musculature du cloaque génital et de la partie du pénis qui y touche, part, comme à l'ordinaire, du rétracteur externe *(re)*. Celui-ci projette d'abord une bande musculaire très large à l'ommatophore *(ro)*; en passant par dessus le pénis, cette bande s'y rattache étroitement à l'aide de courts et nombreux ligaments ou fibres musculaires. La seconde partie, un peu plus grande, du rétracteur ne se divise qu'assez tard en trois ramifications (r_1, r_2, r_3); la première va au pénis et au canal déférent et s'y fixe près de l'attache du rétracteur de l'ommatophore (r_1); la seconde (r_2), au petit tentacule *(rpt)*, mais en se rapprochant du pénis elle vient s'y rattacher par des fibres musculaires et par des ligaments. La 3^e^ branche (r_3), qui va au lobe labial droit *(rl)*, se relie légèrement, en la dépassant, à la partie supérieure du cloaque génital, puis elle envoie une branche latérale à la région inférieure de celui-ci. Le rétracteur pédieux a le parcours de ses fibres musculaires antérieures sur le côté médial du cloaque génital et se fixe à sa base (pl. III, fig. 1, *ra*).

Le nerf pénien va à la fronde pénienne où il s'insère tout près du cloaque génital *(np)*.

Pour cette espèce, il s'est trouvé que, chez plusieurs exemplaires provenant des environs de Munich (Alois Weber, novembre 1920), le pénis faisait défaut, bien que les coquilles fussent toutes développées. La description de Moquin-Tandon[41]) (pag. 358) et sa figure représentant les organes génitaux (pl. XXVI, fig. 1) diffèrent tellement de l'exposition donnée ci-dessus et de ma figure, ainsi que de sa propre reproduction des organes génitaux du *Pupa megacheilos* (pl. XXV, fig. 28), étroitement apparenté à notre espèce, qu'une erreur doit nécessairement s'être produite d'une manière ou d'une autre. En effet, le pénis est figuré comme un tube droit avec un flagellum assez long, prenant naissance au lieu d'accès du canal déférent. La figure de Soós[62]), au contraire, (p. 59 et 145, fig. 34) s'accorde assez bien avec la mienne.

Abida partioti Moq.

Fig. 1 du texte et pl. IV, fig. 1, 2.

Examiné d'après des spécimens presque complètement étendus, provenant des Pyrénées (Luz-Saint-Sauveur, Chr. Petersen, juillet 1908).

L'aspect de la glande hermaphrodite *(gh)* diffère un peu de celui des autres formes examinées des genres *Abida*, *Chondrina* et *Sandahlia*. Elle n'est pas aussi compacte, et chaque faisceau d'acini se distingue facilement, même dans la glande non préparée, ce qui se voit bien aussi sur la figure où la glande est reproduite dans sa position naturelle, enchassée dans le foie supérieur (fig. 1 du texte). Il se constate 4 à 6 faisceaux dont le nombre d'acini est assez variable. Chez l'individu figuré (pl. IV, fig. 1, *gh*) les chiffres sont, pour les 4 faisceaux — comptés de la pointe de la coquille à la base —, 13, 11, 12 et 38. La couleur des acini est blanchâtre, au sommet seulement ils sont couverts d'un tissu conjonctif finement pigmenté. La partie tortueuse du canal hermaphrodite *(dh)* se trouve, chez quelques exemplaires, être assez courte, mais très grosse et à replis serrés; chez d'autres elle est un peu plus allongée, et toujours fortement pigmentée. La poche de fécondation *(pf)*, qui, à l'extrémité, est un peu gonflée et courbée, est complètement dégagée du canal qui y conduit. La glande albuminipare *(ga)* est extrêmement longue et étroite, d'une couleur claire, jaunâtre, et sa structure est nettement composée de lames.

Le spermoviducte est à peu près comme chez les deux espèces précédentes, assez long, étroit dans le bas, fortement dilaté vers le haut. La partie inférieure de l'oviducte est faiblement plissée; la partie supérieure *(ov)* est fortement repliée en zigzag. Les 4 replis supérieurs sont particulièrement accusés; ils sont d'aspect blanchâtre, et les parois épaisses ont une consistance gélatineuse qui les fait contraster avec la partie inférieure, grisâtre, de l'oviducte. La prostate *(pr)* porte, entre le second et le troisième repli de l'oviducte (à partir du haut), une grande saillie triangulaire.

Le vagin *(va)* et l'oviducte libre *(ol)* sont à peu près de la même longueur; le dernier est considérablement plus étroit que le vagin et le pédoncule de la poche copulatrice. Celui-ci comprend une partie inférieure, dilatée *(pd_1)*, et un long pédoncule qui se continue insensiblement dans la vésicule allongée en forme de massue. Dans cette dernière se trouvait un spermatophore, se composant nettement d'une partie principale plus grosse et d'une partie caudale extrêmement ténue (comp. le spermatophore chez les Clausilies, Steenberg[64]), fig. 12).

La structure interne du vagin est unie dans la moitié distale,

et, dans la moitié proximale, garnie de plis longitudinaux bien accentués; ces plis se continuent dans le pédoncule de la poche copulatrice. La vésicule est faiblement et irrégulièrement plissée et verruqueuse. La structure de l'oviducte libre paraît, d'après un examen fait sous le microscope binoculaire, identique à celle des autres espèces du même genre, ce qui, toutefois, n'a pas été démontré par des coupes.

Le cloaque génital *(cl)* est court et garni de plis longitudinaux grossiers. La fronde pénienne est, comme à l'ordinaire, constituée par deux branches, l'une distale, assez grosse, et l'autre, proximale, plus étroite, qui pourtant n'est pas aussi nettement distincte du canal déférent que chez l'espèce précédente. A la courbure entre la section grosse et la section étroite de la fronde, se voit un flagellum tout court, et un peu courbé en crochet. Le canal déférent présente à peu près la même grosseur dans toute son étendue. La structure intérieure du pénis est comme suit: Dans la grosse section de la fronde *(pé)*, la partie distale est garnie de fines verrues ou de faibles plis transversaux; dans la partie proximale, entre l'attache du rétracteur et le flagellum, se voient 4 lames longitudinales élevées, de la même nature que celles de l'*Abida secale*; de ces lames, celle qui se trouve du côté concave est la plus forte et la plus élevée; elle se continue, jusqu'à une certaine distance, dans la partie distale; du côté opposé, elles se prolongent toutes les 4 dans le *flagellum.* La section étroite du pénis *(ép)* présente 4—5 plis longitudinaux, de différente hauteur; l'un d'eux est uni, les autres 3 à 4 portent, sur les côtés, des lamelles transversales. Vers le canal déférent les plis convergent et deviennent plus étroits et plus accusés.

Musculature des organes génitaux (pl. IV, fig. 1, 2): Le puissant rétracteur pénien libre *(rp)* passait, chez les spécimens examinés, à travers un nœud formé entre le flagellum et la partie distale de la section pénienne étroite. Il ne se rattache qu'à la grosse section pénienne, distale, à peu près sur le milieu. Le rétracteur externe *(re)* est, par son extrémité antérieure, solidement fixé à la fronde pénienne, dans la partie de celle-ci la plus rapprochée du cloaque génital. La fig. 2, pl. IV, montre le point d'attache du muscle chez un individu où le pénis était plus étendu que dans la figure principale. Les conditions sont à peu près ana-

logues à celles que nous connaissons par le *Chondrina avenacea*, excepté que les ramifications latérales, partant de l'ommatophore *(ro)* et du petit tentacule *(rpt)*, sont plus indépendantes; ces deux branches, constituées par de larges bandes musculaires, viennent presque à se rejoindre; elles ne sont séparées que par le nerf de l'ommatophore qui passe à cet endroit.

L'insertion (fig. 1, *np*) du nerf pénien est placée près du cloaque génital.

Abida secale Drap.

Pl. V, fig. 1.

Dissection faite d'après des individus à peu près étendus, provenant de Birdlip, Angleterre (Overton).

La glande hermaphrodite *(gh)* est grande et compacte, à deux ou trois échancrures; elle parcourt au moins un demi tour. Le long du côté concave s'étend un conduit commun dans lequel débouchent les nombreux acini; ceux-ci sont relativement petits, blanchâtres et piriformes, aux sommets finement pigmentés. Le canal hermaphrodite *(dh)* est d'un blanc jaunâtre, à l'éclat soyeux; dans la moitié distale, il présente de nombreux zigzags serrés. Les replis se dessinent nettement, un pigment noir étant largement déposé entre eux. Une partie courte, toute droite, mène à la poche de fécondation courbée en crosse *(pf)*, et dont la région inférieure est cachée dans la glande albuminipare *(ga)*. Celle-ci est triangulaire, pointue, et coupée en biais dans le bas, descendant d'avantage en dessus qu'en dessous. Quelques-uns de ses acini sont bordés d'un pigment fin.

Le spermoviducte est large dans les deux tiers proximaux, étroit dans le tiers inférieur. La prostate *(pr)* est fortement développée; elle est large en haut, rétrécie et cunéiforme vers le bas, et constituée par de grandes sections lamelliformes. Sur une certaine étendue de l'oviducte elle le surplombe, à l'extérieur, comme un toit. Sa surface présente, dans le sens de la longueur, un grand sillon, assez profond (l'emplacement de l'intestin). L'oviducte commence par une chambre d'albumine blanche et gonflée; celle-ci se continue dans l'oviducte proprement dit, dont les parois sont gris jaune et d'une nature différente et moins compacte que celle des

parois de la chambre. Le côté extérieur de l'oviducte, c'est-à-dire le côté opposé à la columelle, est fortement renflé et forme des replis dont les angles sont alternativement saillants et rentrants. Les côtés de ces angles sont indiqués par les chiffres *1* à *9*. La chambre de l'albumine se continue dans le premier de ces replis qui est étroit et en partie caché sous la glande albuminipare; il est formé par les côtés $1+2$, et a la pointe tournée en haut. Le second repli (formé par les côtés $2+3$) est très long et se prolonge jusque sur la face inférieure de l'oviducte; il a la pointe tournée en bas et en dedans, tout à fait sur le côté columellaire. Le côté *3* de cet angle monte en décrivant une vaste courbe, et forme, en se joignant avec *4*, une anse, la courbure tournée en haut; c'est celle qui, dans la figure, domine le plus, et qui est située juste au-dessus de la vésicule de la poche copulatrice *(rs)*, ou, dans sa partie distale, au-dessous de celle-ci. Les autres 5 plis *(5* à *9)* ont plutôt le caractère de simples renflements. La partie tout en bas de l'oviducte *(ov)* est à peu près unie; elle présente tout au plus quelques fines sinuosités.

Sur le dessus du spermoviducte se trouve une partie blanche, en forme de spatule, et nettement délimitée; elle est logée entre le canal séminal et la prostate, mais s'étend, jusqu'à une certaine distance, sur cette dernière. C'est le cul-de-sac de l'oviducte. Il monte assez haut, presque à la pointe du second repli de l'oviducte $(2+3)$.

L'oviducte libre *(ol)* est très étroit et un peu plus court que le vagin *(va)*; sa largeur n'égale que le tiers ou la moitié de la partie inférieure du pédoncule de la poche copulatrice, lequel est fortement développé (pd_1). Le reste de la poche est de même très vigoureux. La région supérieure du pédoncule est un peu plus étroite *(pd)*; elle passe insensiblement dans la vésicule *(rs)*, qui est très large, en forme de massue et enchassée entre la prostate et l'oviducte. Dans tout son parcours, la poche copulatrice est reliée à l'oviducte par de fins filaments de tissu conjonctif. De nombreux ligaments conjonctifs et fibres musculaires rattachent la partie inférieure du vagin à la paroi du corps.

Le pénis *(pé)* est très bien développé; il forme une grande fronde, s'étendant librement sous la peau du cou et le diaphragme,

sans y être relié, ni par des muscles, ni par du tissu conjonctif. Les deux parties de la fronde n'ont pas la même longueur; la section proximale, située entre l'embouchure du canal déférent et l'endroit où le pénis se recourbe, ne constitue que les deux tiers environ de la section distale, qui va de la courbure au cloaque génital. La région la plus proche de celui-ci est la partie la plus étroite du tube pénien; le reste en est assez gros; vers le canal déférent le pénis diminue assez brusquement de grosseur; çà et là se voient sur le tube de faibles renflements. Le rétracteur pénien, grand et vigoureux *(rp)*, ne se fixe qu'au milieu de la section distale de la fronde pénienne, mais de l'attache part, en s'avançant plus loin, toute une bande de fines fibres musculaires qui vont se fixer à la section proximale de la fronde, située en face; (elles ne sont pas dessinées dans la figure).

Un autre rétracteur pénien supplémentaire (rp_1) va, comme une ramification extrêmement vigoureuse, du rétracteur de l'ommatophore jusqu'au point où le canal déférent débouche dans le pénis. Des filaments vont en outre à la section distale du pénis située en face, réunissant les deux branches de la fronde. A cet endroit, le canal déférent qui, dans la dernière partie de son étendue, est étroitement pressé contre la partie extérieure du pénis, est entièrement caché par un manteau musculaire qui l'entoure ainsi que le pénis. Le canal déférent se distingue pourtant à travers la couche musculaire. Ce canal a d'ailleurs son parcours normal; il est blanchâtre, à reflet soyeux et un peu épaissi dans sa partie proximale.

Structure interne du pénis: Au point d'accès du canal déférent commencent, dans la section proximale du pénis, 4 plis, presque lisses à la surface et un peu irréguliers; ils se transforment assez vite en 4 autres fortement accusés, dont la coupe transversale est triangulaire (elle forme un triangle équilatéral). Les côtés de ceux-ci sont sillonnés par des lamelles régulières, un peu inclinées vers le canal déférent, de façon que leur structure ressemble à celle d'une plume (pl. XXXIV, fig. 3). Dans la dernière moitié de la section proximale du pénis, les lamelles diminuent de hauteur, et les sillons latéraux deviennent plus irréguliers.

Dans l'angle situé entre les deux sections du pénis, les deux lamelles, placées côte à côte, l'une sur le côté concave, l'autre sur le côté convexe, augmentent de hauteur jusqu'à se toucher;

les deux autres deviennent basses et irrégulières, puis, vers le côté distal, elles se ramifient et finissent par s'effacer. Les deux grandes lamelles se distinguent dans toute la section distale de la fronde, mais elles s'abaissent assez vite et se ramifient, et la dernière région, juste avant d'arriver au cloaque génital, est à peu près lisse. Dans tout le tube pénien se voit dans la paroi une forte musculature de forme circulaire, bien distincte.

Le nerf pénien *(np)* va à la section distale du pénis. Dans l'angle de ramification en forme de V, où le conduit mâle et le conduit femelle s'ouvrent dans le cloaque génital, courent, outre le rétracteur de l'ommatophore (pointillé dans la figure), deux nerfs venant du ganglion pédieux et se fixant à la paroi du corps, aux environs de l'orifice génital. Les branches antérieures du rétracteur pédieux vont à la partie située juste en arrière et en dessous de l'orifice génital; de là partent, comme des branches latérales, quelques minces fibres musculaires, aboutissant au cloaque génital même.

Abida frumentum Drap.

Fig. 2—10, 14 et 15 du texte.

L'examen a été fait sur des individus en état de contraction complète (Klett, Thuringe).

La glande hermaphrodite est grande et parcourt un demi tour env. Elle ressemble beaucoup à la glande correspondante des autres espèces du genre *Abida,* mais comme les animaux de l'espèce dont nous parlons étaient mieux fixés, il était possible de distinguer ici les détails plus fins de la structure, desquels nous donnerons par suite une description plus complète que pour les autres espèces. Après avoir isolé la glande hermaphrodite du foie supérieur, elle se présente comme une masse gris foncé, recourbée en forme de croissant, et compacte en apparence, constituée par de nombreux acini; vers la surface on voit le sommet de tous les acini, tandis que leur partie intérieure et les fines voies d'excrétion des deux côtés sont couvertes, au contraire, d'un tissu conjonctif grisâtre, présentant partout le même caractère. Quand celui-ci a été écarté, on voit nettement les voies d'excrétion, et la glande hermaphrodite apparaît alors comme étant composée de 5 faisceaux d'acini qui, par des conduits extrêmement fins, débouchent dans le conduit

collecteur. Les acini eux-mêmes sont clairs, mais couverts d'un tissu conjonctif pigmenté; le pigment se trouve déposé surtout entre les acini. La dimension de ces derniers varie considérablement;

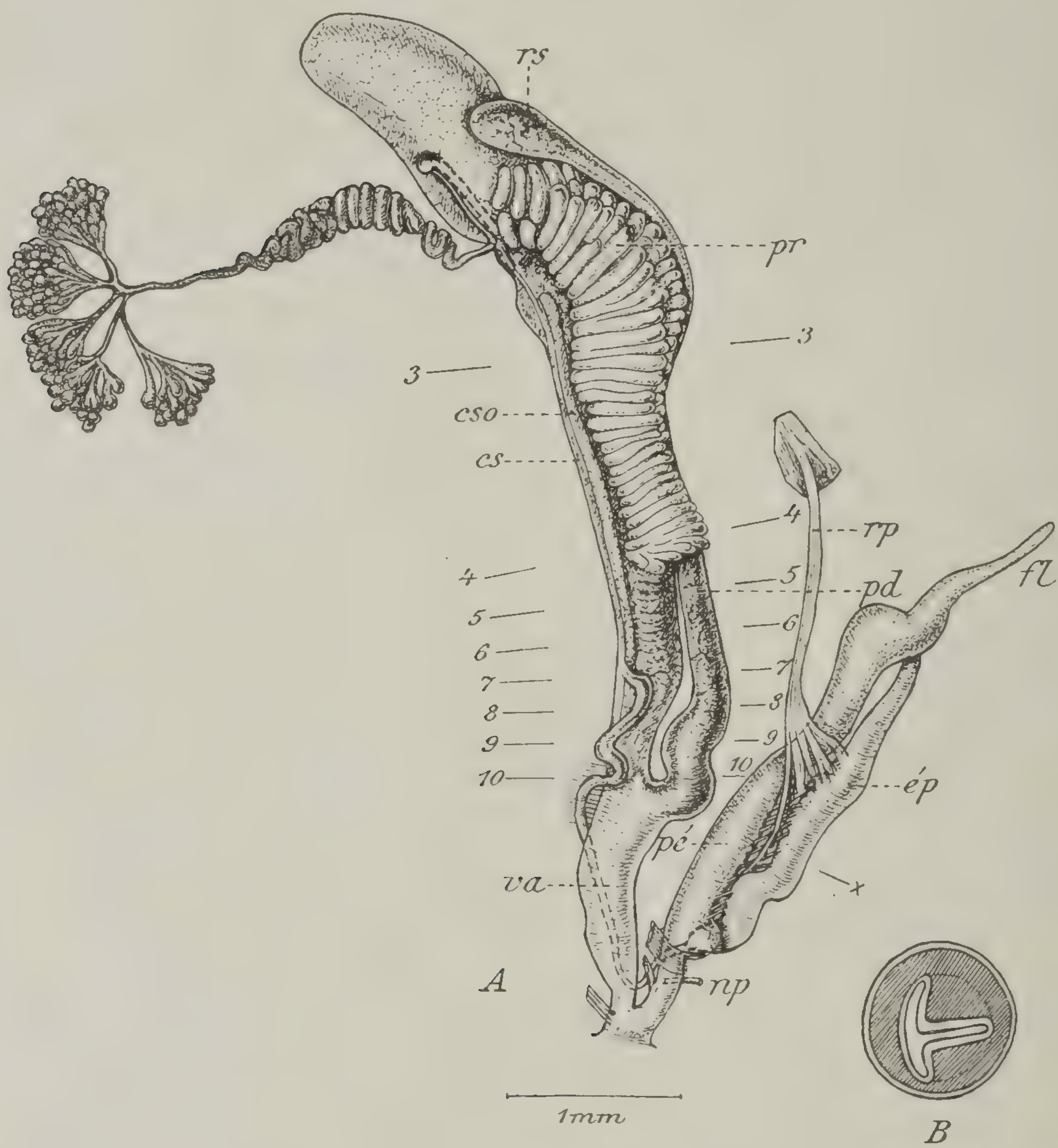


Fig. 14 *A*. Organes génitaux d'*Abida frumentum* Drap., vus par dessus. — *cs*, canal séminal; *cso*, cul-de-sac de l'oviducte; *ép*, épiphallus; *fl*, flagellum; *np*, nerf pénien; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pr*, prostate; *rp*, rétracteur pénien; *rs*, poche copulatrice; *va*, vagin. — Les chiffres *3—10* indiquent les points par lesquels sont menées les 8 coupes transversales, représentées par les figures 3–10. ×, direction de la coupe transversale de l'épiphallus, montrée dans la fig. 14 *B*.

autour des plus grands s'observent des cercles composés d'autres, plus petits.

Le canal hermaphrodite est dans sa première partie droite, comme dans la première moitié de la partie tortueuse, fortement pigmenté, presque tout à fait noir. Dans la dernière partie de la région tortueuse, où les zigzags sont plus réguliers, les replis jaunes, à reflet soyeux, se distinguent à travers le manteau de

tissu conjonctif noir. La partie distale est constituée par un tube très fin, s'étendant le long de la poche de fécondation, à peu près jusqu'au sommet de celle-ci. La poche même a la forme d'un bâton, dont l'extrémité est semblable à un bouton. Cette extrémité — et quelquefois une étroite bande du reste de la poche — sont les seules parties qui s'aperçoivent du dehors sans préparation, la poche étant, à part ces parties, entièrement cachée dans la glande albuminipare. Cette dernière *(ga)* est blanchâtre, sans pigment, et sans sillons profonds pour l'intestin, qui la contourne.

Le spermoviducte est très long. Sur la face supérieure s'étend une large bande, d'un blanc jaune: la prostate (fig. 14 *A*, *pr*), plus large dans sa moitié supérieure, plus étroite dans l'inférieure, mais qui ne se rétrécit pas vers le bas en forme de coin, comme on le voit souvent. La glande se compose de tubes assez larges, disposés en rangs transversaux. Le long du côté columellaire de la prostate court un conduit, le cul-de-sac de l'oviducte *(cso)*, atteignant à peu près l'extrémité supérieure du spermoviducte; ce conduit est enchassé entre la prostate et le canal séminal *(cs)*, dont le bord labial libre se distingue à travers la paroi comme une ligne claire, parallèle au conduit. La région inférieure du spermoviducte, où il n'y a pas de prostate, est presque lisse; elle se divise dans le sens de la longueur en deux parties, l'une de couleur gris foncé, l'autre plus claire. Dans le bas, sur la limite entre ces deux parties, s'ouvre le canal déférent. La partie claire constitue la région inférieure du cul-de-sac de l'oviducte; la partie gris foncé, la région inférieure distale de l'oviducte même. La conformation intérieure de l'oviducte libre, ainsi que de la région distale du spermoviducte, a déjà été décrite et figurée, p. 19—22, fig. 2—10 du texte. La partie proximale de l'oviducte (fig. 15 du texte) est d'une autre nature que la distale; elle est de couleur plus pâle, et les parois ont une consistance gélatineuse; elles forment, comme à l'ordinaire, de grands replis en forme de V, sur le côté tourné en dehors. Seulement les 4 premiers (n^os^ 1—4) et surtout le 2^e^ + le 3^e^ (comp. l'espèce précédente), sont de grandeur considérable; les autres ne forment que quelques plis transversaux peu profonds, et se continuent, en s'effaçant de plus en plus, dans la partie grise, assez lisse, de l'oviducte.

L'oviducte libre est très court et blanchâtre. Sa partie distale

et la région proximale du vagin se fixent, par de nombreuses fibres musculaires, à la paroi du corps (fig. 15 du texte). Plusieurs filaments, à reflets soyeux — probablement des fibres musculaires — relient également la section femelle, grise, du spermoviducte, aux

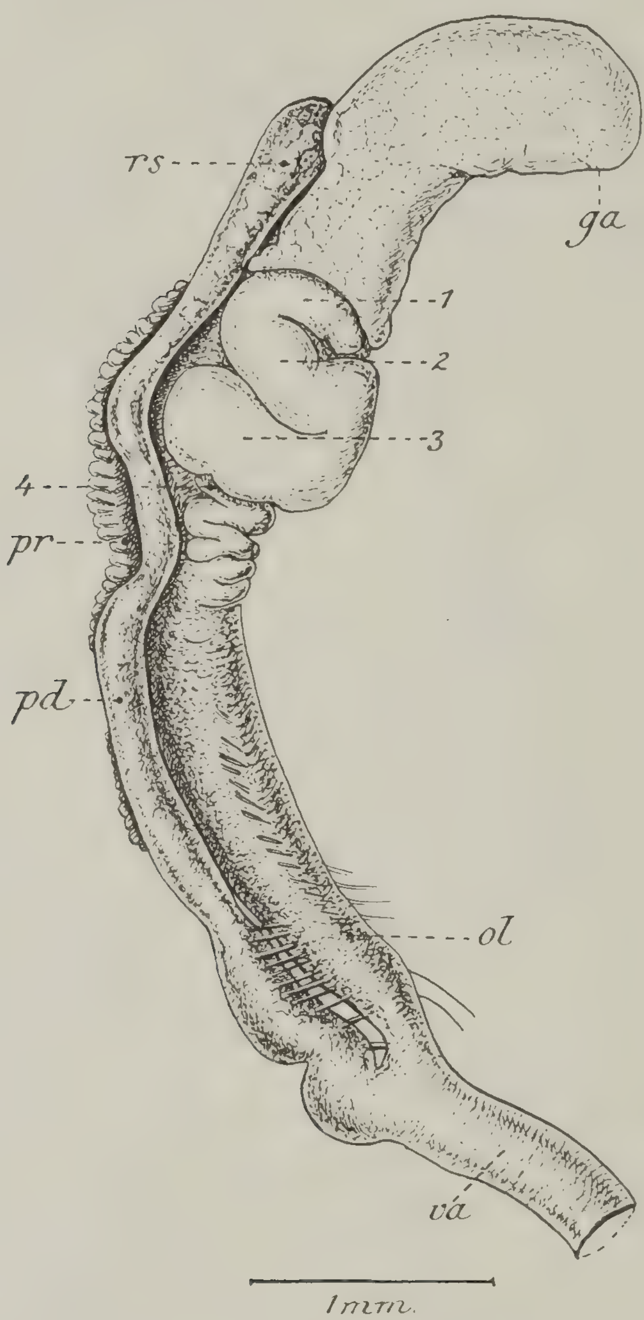


Fig. 15. Organes génitaux femelles d'*Abida frumentum* Drap., vus par dessous. — *1—4*, replis supérieurs de l'oviducte; *ga*, glande albuminipare; *ol*, oviducte libre; *pd*, pédoncule de la poche copulatrice; *pr*, prostate; *rs*, poche copulatrice; *va*, vagin.

membranes partant des bords du muscle columellaire. Le vagin (fig. 14, 15, *va*) est bien développé, d'un blanc jaunâtre, sans pigment; il présente, à l'intérieur, 7 ou 8 plis, blancs et fortement accentués, dont un certain nombre se continuent dans le pédoncule de la poche copulatrice; le plus fort des plis se trouve du côté où prend naissance le pédoncule.

La poche copulatrice *(rs)* est très fortement développée; son pédoncule *(pd)* est, surtout en bas, très large et à parois épaisses; il est même, à cet endroit, plus large que l'oviducte libre. Le pédoncule part du côté du pénis et court dans une rainure entre la prostate et l'oviducte sur leur face extérieure; vers le haut, il diminue de calibre, mais reste toujours d'une dimension assez considérable. La grande vésicule en massue ne commence que dans l'extrémité supérieure du spermoviducte et s'étend jusque sur les faces extérieure et supérieure de la glande albuminipare. Toute la poche est fortement pigmentée. A l'intérieur, la vésicule est à peu près lisse, le pédoncule, au contraire, est plissé dans sa région inférieure, et irrégulièrement crispé et froncé dans la région supérieure.

Le pénis (fig. 14 *A*, *pé* + *ép*) constitue une longue fronde, avec un cul-de-sac *(flagellum, fl)* bien développé à l'endroit où il se recourbe; chez les animaux complètement contractés, la fronde pénienne est tordue en forme d'X. Sa partie proximale *(ép)* est cylindrique, plus grosse dans le milieu et s'atténuant régulièrement vers les deux extrémités. La partie distale *(pé)* est, dans la région extérieure, qui touche au cloaque génital, cylindrique, et c'est à cette région que se rattache le canal déférent, puis il s'élargit brusquement d'un côté en forme de sac; contre celui-ci se trouvent serrées la dernière partie du canal déférent ainsi que la partie proximale du pénis, dans laquelle débouche ce canal. Les deux parties du pénis, comme le canal déférent, sont à cet endroit reliées par un manteau musculaire, vigoureux, en forme d'anneau. Le reste de la partie distale de la fronde pénienne est cylindrique et de calibre un peu variable; vers l'endroit où elle se recourbe, le tube s'élargit, et de là part un long cul-de-sac *(flagellum, fl)*, plus gros à son lieu de naissance et s'atténuant régulièrement vers l'extrémité libre, qui n'a aucune dilatation, comme on en voit souvent sur les appendices péniens; il peut, au contraire, se courber en forme de crochet. Les deux parties de la fronde pénienne sont bien accusées par rapport l'une à l'autre.

La structure intérieure du pénis est comme suit: L'extrémité tout près du cloaque génital est à peu près lisse; au renflement en forme de sac commencent 6—7 lames irrégulièrement ramifiées, qui se continuent dans toute la partie distale de la fronde; dans

la région la plus proche du cul-de-sac, le nombre n'en est que 4—5, et ces lamelles, qui se prolongent dans ce dernier, sont ici plus accentuées; la lame située du côté convexe du pénis, est haute et finement crispée.

La seconde moitié de la fronde pénienne, la moitié proximale *(épiphallus, ép)*, est, intérieurement, lisse d'un côté, mais de l'autre, celui qui est tourné vers la partie distale de la fronde, deux fortes lames prennent naissance (fig. 14 *B*); l'une de celles-ci surtout est haute et fortement accentuée. Entre ces deux lames se voit, à l'endroit où la fronde se replie, l'ouverture qui conduit à la lumière de la partie distale du pénis.

Musculature (fig. 14 *A*): Entre les deux parties de la fronde pénienne courent obliquement plusieurs fines bandes musculaires qui les relient; toutefois, la région la plus proche du flagellum en est dépourvue. Au milieu de ces fibres musculaires se rattache le rétracteur pénien *(rp)*; vers le côté distal, les filaments de celui-ci vont directement au pénis pour s'y fixer, tandis que vers le flagellum, où cessent les fibres musculaires obliques, ci-dessus mentionnées, plusieurs d'entre eux s'insèrent à l'épiphallus. En passant entre les voies d'excrétion mâles et femelles, le rétracteur de l'ommatophore projette, aux environs du cloaque génital, une bande musculaire courte, mais très large et très vigoureuse, dont les fibres entourent, comme un rond de serviette, la partie extérieure du pénis et la dernière partie du canal déférent; l'ommatophore arrive de cette manière à agir comme un second rétracteur pénien. De la base du rétracteur de l'ommatophore part une large bande musculaire qui va directement à la partie la plus distale du pénis, s'y fixant en dehors de l'attache du rétracteur de l'ommatophore proprement dit. Les rétracteurs de la petite tentacule et du lobe labial constituent des bandes assez larges, jointes par du tissu conjonctif pigmenté; de celles-ci prend naissance une autre bande musculaire courte allant au cloaque génital.

Le nerf pénien (fig. 14 *A*, *np*) va à l'extrémité du pénis près du cloaque génital.

La courte description du *Pupa frumentum*, var. *illyrica*, faite par A. Schmidt[56]), p. 42, ainsi que ses figures (pl. 10, fig. 81), sont exactes pour ce qui est des traits essentiels; la forme de la vésicule de la poche copulatrice n'est pourtant pas d'accord avec

celle qui a été observée par moi. A. Schmidt la dessine, en effet, comme étant tout à fait globulaire et nettement distincte du pédoncule. On pourrait s'imaginer peut-être que la variété diffère, en ce point, de la forme principale, mais ce n'est pas vraisemblable. La différence qui existe entre les parties distales des voies d'excrétion, reproduites dans sa figure, et celles de la mienne, est due peut-être à la circonstance que la figure de Schmidt a été dessinée probablement d'après un individu étendu, la mienne d'après un exemplaire contracté.

L. Soós[62]), p. 56—58 et 145, fig. 32, a décrit et figuré la forme principale. Sa figure est, sous certains rapports, un peu difficile à comprendre, les organes génitaux n'ayant pas été étendus avant d'être dessinés. Pour ce qui concerne la vésicule de la poche copulatrice, la description ne s'accorde ni avec la figure de l'auteur lui-même ni avec la mienne. Il y est dit qu'elle est nettement accusée par rapport au pédoncule (ce qui correspond à la description de Schmidt), tandis que, suivant la figure, la transition du pédoncule à la vésicule se fait assez insensiblement, tout à fait comme dans la figure dessinée par moi. Que le vagin soit très court, cela paraît assez invraisemblable; A. Schmidt indique le contraire, et même ceux de mes individus en état de contraction complète, présentent un vagin assez long. L. Soós, et A. Schmidt de même, montrent en outre le rétracteur comme se fixant uniquement à la partie distale du pénis. Les conditions particulières du mode d'attache ont été exposées ci-dessus, mais si on fait abstraction de la bande par laquelle il se fixe aux fibres musculaires entre les deux branches du pénis, le rétracteur pénien serait inséré essentiellement sur la partie proximale du pénis. Pour le reste, nos figures sont d'accord; ainsi L. Soós a remarqué que la glande hermaphrodite se compose de plusieurs sections séparées; il en indique 6 à 7; mais la manière dont ces faisceaux sont reliés au conduit collecteur diffère de celle qui a été décrite plus haut. L. Soós et l'auteur de la présente étude sont également d'accord pour ce qui concerne la structure du pénis. L'appendice (le *flagellum*) représente une continuation de la partie distale du pénis, et non pas, ainsi que Schmidt le décrit et le figure, une continuation de la partie pénienne proximale, qui est, au contraire, nettement accusée par rapport à la distale. L. Soós fait remarquer que cette

partie (la proximale) doit être regardée comme la dernière région épaissie, du canal déférent (épiphallus). Il est très vraisemblable que cette opinion est juste.

Sandahlia cylindrica Mich.

Pl. VI, fig. 1, 2; VII, fig. 1, 2.

La dissection a été pratiquée sur des individus contractés, provenant de Besalú, Prov. Gerone, Espagne. (F. Haas, le 2 mai 1917).

La glande hermaphrodite *(gh)* parcourt un demi tour; elle consiste en une masse cohérente, courbée en croissant, dont les acini apparaissent comme de petits follicules courts, pigmentés de noir au sommet. Ils sont tous placés de la même manière, en direction radiaire, et la coupe transversale de la glande présente, par conséquent, la forme d'un coin, plus large au dehors, vers la surface des tours du corps, plus étroit du côté intérieur, vers la columelle. Si on regarde la face supérieure (face apicale) du tour qui renferme la glande hermaphrodite (après avoir écarté le tour situé au-dessus), on aperçoit que cette dernière ne s'étend que jusqu'à mi-chemin vers la surface, et, par suite, ne se voit pas du dehors. A cause de la pression du sac hépatique, l'épaisseur du côté extérieur de la glande varie suivant les différents endroits, et on y observe en outre 3 échancrures en forme d'arcs. Le nombre des acini est de 80 à 100.

Le canal hermaphrodite *(dh)* est remarquablement long, à cause des tours nombreux de l'animal. La première moitié de la partie non enroulée est blanche, la dernière moitié pigmentée. Les replis en zigzags de la partie tortueuse sont — au moins d'un côté — assez régulièrement disposés; ils sont jaunes, à reflets soyeux. La pigmentation est forte dans la première partie, dans la dernière on ne constate qu'un peu de pigment entre les circonvolutions. La poche de fécondation *(pf)* est entièrement visible, et située bien avant vers le côté externe. Elle se compose d'un long tube, d'égale épaisseur partout, qui s'enroule 2 ou 3 fois sur lui-même à son extrémité (pl.VI, fig. 2). La dernière partie du canal hermaphrodite descend d'abord jusqu'à la limite entre la glande albuminipare et la prostate, puis elle se recourbe vers le haut en angle aigu, comme un mince conduit blanc qui débouche au sommet de

la poche de fécondation, de laquelle il est séparé par une limite bien accentuée. La partie distale de cette poche s'enfonce obliquement jusqu'au milieu de la masse de la glande albuminipare où elle rencontre la chambre de l'albumine et le canal séminal. La glande albuminipare est très allongée, demi-cylindrique, avec une profonde échancrure transversale (pl. VI, fig. 1, *ci*) du côté extérieur, près du sommet, et un sillon longitudinal, plus faible et plus rapproché du côté columellaire. Ces dépressions indiquent l'emplacement de l'intestin.

Le spermoviducte est long, étroit en bas, large en haut. L'aspect varie considérablement suivant qu'on le regarde par la face extérieure et inférieure ou par la face supérieure. En dessus (pl. VII, fig. 1) on n'aperçoit, dans les trois quarts supérieurs, que la prostate *(pr)* et, du côté intérieur, vers la columelle, le canal séminal, grisâtre, ainsi que le cul-de-sac de l'oviducte. Si on le regarde en dessous et extérieurement (pl. VI, fig. 1), ce sont l'oviducte *(ov)* et la poche copulatrice *(rs)* qui prédominent; la prostate *(pr)* ne présente, dans la partie supérieure, que l'extrémité de quelques lobes; plus vers le bas, elle est entièrement cachée par la poche mentionnée, et seulement du côté distal de celle-ci elle apparaît de nouveau. L'oviducte *(ov)* varie sensiblement de forme et de consistance dans ses différentes régions; on en peut distinguer trois: une section supérieure blanche, à parois d'une consistance assez ferme, et formée par les replis *1*, *2* et *3*; une autre, jaune, fortement plissée *(4—8)*, laquelle est jointe par une partie plus mince *(9)* à la 3e région, qui est blanchâtre, un peu gélatineuse, munie de plis transversaux réguliers et de raies blanches (c'est le revêtement épithélial interne qui se distingue à travers les plis). Vers le bas (du côté distal) la paroi prend peu à peu une consistance plus ferme. Ce n'est que sur la face externe que l'oviducte est plissé; le côté tourné vers la prostate est lisse à l'extérieur. L'oviducte libre *(ol)* est régulièrement cylindrique. Ses plis intérieurs, qui plus tard le divisent pour former le canal muqueux et le cul-de-sac de l'oviducte, commencent bien en bas. La première partie du canal muqueux (l'oviducte proprement dit) présente, à l'intérieur, de forts plis, disposés obliquement, et bien accentués.

Le vagin *(va)* est un peu plus court que l'oviducte libre, large et un peu aplati; il passe insensiblement dans la base du pédon-

cule de la poche copulatrice *(pd_1)*. La face interne du vagin est garnie de nombreux plis longitudinaux, bas et quelquefois bifurqués. La poche copulatrice est assez longue, le pédoncule *(pd)* est plus gros dans le tiers inférieur, puis il se rétrécit un peu vers la vésicule *(rs)*; cette dernière est allongée, en forme de massue et courbée en croissant. Dans la partie inférieure du pédoncule se trouvent, intérieurement, de forts plis, à bord libre arrondi; la face interne de la vésicule est finement verruqueuse.

Le cloaque génital *(cl)* est court, mais nettement délimité. Le pénis *(pé + ép)* est constitué par un tube cylindrique courbé en forme de fronde allongée et étroite. Les deux parties de cette fronde ont à peu près le même diamètre extérieur. Il n'existe pas de cul-de-sac *(flagellum)* sur le pénis. Le canal déférent *(vd)* se distingue nettement de la partie proximale de celui-ci; il commence par un tube assez mince, qui suit le pénis et le vagin, mais dans son parcours le long de l'oviducte libre il est considérablement plus gros et plus musculeux.

La lumière du pénis est restreinte par des plis (pl. VII, fig. 2). Dans la partie auprès du cloaque génital s'en trouvent d'irréguliers, dont plusieurs se confondent vers l'extérieur en un seul particulièrement accusé qui, semblable à une langue, saillit dans le cloaque génital. Plus haut dans le pénis, à l'attache du rétracteur, se voient 6 plis, bas mais nets et réguliers, à section transversale triangulaire, et aux côtés finement crispés et incisés. Le reste de la fronde pénienne (pl. VII, fig. 2, *ép*) est muni de 4 plis, forts et élevés, qui ont pourtant çà et là une certaine disposition à se ramifier et à devenir plus irréguliers. Dans la région la plus rapprochée du canal déférent, la section transversale de ces plis devient, comme à l'attache du rétracteur, de forme triangulaire, aux bords découpés, ainsi que chez l'*Abida secale*.

Musculature des organes génitaux (pl. VII, fig. 2): Le rétracteur pénien libre *(rp)* est assez vigoureux, en forme de ruban; il prend naissance au diaphragme, exactement à la distance d'un tour du collier palléal (chez les exemplaires contractés) et s'étend entre le pénis et le conduit excréteur femelle. L'attache au pénis se trouve dans la partie distale de la fronde pénienne, un peu au-dessous du milieu. Du rétracteur céphalo-pédieux droit *(retractor externus, re)* part une large bande musculaire, dont une partie *(ro_1)* se fixe à la ré-

gion la plus distale du canal déférent et au pénis; ces deux derniers sont enveloppés par les fibres musculaires comme par une manchette; la seconde partie *(ro_2)* se rattache au canal déférent et au pénis, plus près du cloaque génital. Du point de jonction entre ces deux bandes part le rétracteur de l'ommatophore proprement dit *(ro)*, qui sur une assez grande étendue, jusqu'au pénis, est soudé à la plaque formée par les deux bandes musculaires réunies. La base du tronc commun des trois branches que nous venons de mentionner, projette vers le petit tentacule *(rpt)* un muscle auquel se joint un faisceau musculaire de renforcement, partant d'une bande sous-jacente qui va au lobe labial et à la base du cloaque génital *(rl + ra)*.

Le nerf pénien vigoureux *(np)* a son parcours entre les deux bandes musculaires se joignant au rétracteur de l'ommatophore et allant à la partie distale du pénis et au canal déférent.

A notre connaissance, cette espèce n'a jamais été étudiée jusqu'à présent.

Orcula dolium Drap.

Pl. VIII, fig. 1 et 2.

Les exemplaires sur lesquels se basent ces études étaient dans un état de contraction complète (Munich, juillet 1921; Alois Weber).

La glande hermaphrodite *(gh)* se trouve enchassée dans le foie supérieur; elle a à peu près la même couleur que celui-ci, et il est, par conséquent, assez difficile de la distinguer et de la préparer. Les acini forment 7 faisceaux renfermant respectivement les nombres d'acini suivants: 25, 20, 11, 14, 10, 10 et 16. Chacun des acini est long et tubulaire, les faisceaux ont une forme allongée, semblable à une pyramide renversée. Le canal hermaphrodite *(dh)* est fortement pigmenté. La poche de fécondation *(pf)* est assez particulière, extraordinairement courte, et elle n'est pas cachée dans la glande albuminipare. Elle constitue un bâton court, presque droit, et non pigmenté, dans le milieu duquel débouche le canal hermaphrodite. A sa base cette poche aboutit dans l'oviducte, à l'endroit où celui-ci forme une chambre assez grande, grisâtre, à moitié transparente et presque globulaire (chambre de l'albumine, *ch*); on la voit dans la figure saillir sur le côté interne au-dessous

de la glande albuminipare et de la poche de fécondation. La glande albuminipare *(ga)* est allongée, fortement courbée à l'extrémité. Sur la face extérieure se trouve une grande dépression où est logé le réceptacle séminal, extrêmement grand.

Par opposition à toutes les espèces que nous venons de décrire, le spermoviducte est, chez l'*Orcula,* à peu près de la même largeur partout, seulement dans l'extrémité la plus distale il se rétrécit un peu. L'oviducte est de structure très simple, et les parois semblent être de la même couleur et de la même consistance dans toutes ses régions; il constitue dans son ensemble un tube, qui présente, il est vrai, çà et là des renflements, mais qui ne possède pas les formations de plis profonds et compliqués qui, en général, caractérisent la partie proximale. Sur le côté externe de l'oviducte, on ne remarque qu'un petit renflement dans le milieu, cachant le bord de la prostate, et à la base de la vésicule de la poche copulatrice, une faible échancrure. Du côté opposé, un peu plus vers le haut, se trouve une découpure plus profonde (qui ne se voit pas dans la figure), délimitant la chambre *(ch)* ci-dessus mentionnée, qu'on voit, dans la figure 1, saillir vers le bas, sous la poche de fécondation. La prostate *(pr)* constitue une large bande qui commence tout en haut, à la glande albuminipare, et qui se termine en s'atténuant, à une certaine distance, du côté proximal, du point où prend naissance le canal déférent.

La structure de cette glande *(pr)* est particulièrement belle; elle apparaît comme nettement composée de tubes relativement longs et bien séparés, qui aboutissent dans le canal séminal. Plusieurs de ces tubes sont fourchus, surtout dans la partie de la prostate détournée de la poche copulatrice. Ils sont disposés en rangs transversaux formé chacun de 2, 3 ou 4 tubes; assez souvent, un rang transversal est constitué par deux tubes bifurqués.

Le cul-de-sac de l'oviducte (pl. VIII, fig. 2, *cso*) est d'une nature particulière, formant une poche allongée et plate, de couleur blanche, et à parois minces et lisses; on voit nettement qu'il est situé sur la face columellaire de l'oviducte, entre la prostate *(pr)* et le canal séminal *(cs),* et il ne constitue pas, comme chez les espèces que nous venons de décrire, un long conduit étroit, en forme de tube, et traversant l'oviducte dans toute sa longueur.

L'oviducte libre *(ol)* est long et cylindrique; la partie distale

est, à l'intérieur, munie de plis longitudinaux, la proximale est lisse, et dans cette dernière s'avance la longue lamelle émoussée et nettement délimitée, qui plus tard sépare le cul-de-sac de l'oviducte de l'oviducte proprement dit, et qui renferme le canal séminal *(cs)*.

Le vagin *(va)* est extrêmement court (l'exemplaire était fortement contracté), muni à l'intérieur de petits plis longitudinaux; le cloaque génital *(cl)* est encore plus court.

La poche copulatrice *(pd_1, pd* et *rs)* est, chez cette forme, extraordinairement bien développée, s'étendant, à cause de la petite longueur du vagin, environ depuis le cloaque génital jusqu'à la région extérieure de la glande albuminipare. L'extrémité de la vésicule dépasse en tout cas le milieu de cette glande. Quant à la largeur, elle fait également l'effet d'être très considérable. Le quart inférieur du pédoncule *(pd_1)* est extrêmement gros; dans celui-ci se trouvent quelques plis longitudinaux grossiers, irrégulièrement construits, et, un peu plus haut, 5 à 6 plis réguliers, ayant une tendance à prendre le même aspect que les lamelles du pénis chez l'*Abida secale* (pl. XXXIV, fig. 3). Dans le reste du pédoncule *(pd)*, formant la moitié de toute la poche, les plis longitudinaux se font de plus en plus faibles et irréguliers, et ils disparaissent entièrement dans l'énorme vésicule *(rs)* en forme de massue et courbée en croissant, qui repose sur la glande albuminipare et la prostate. Elle renfermait les restes indistincts d'un spermatophore.

Le pénis *(pé* et p_1 jusqu'à p_4*)* est vigoureux et bien particulier, se composant de plusieurs régions hétérogènes. La grosse partie courte auprès du cloaque génital se continue en un cul-de-sac tubulaire, très long et courbé *(appendix, ap)*; sur la limite entre ces deux parties se rattache le rétracteur pénien *(rp)*. Au-dessus de l'attache musculaire, le pénis se continue en un tube qui, au début, est étroit et bien distinct de l'appendice, mais qui, plus tard, se dilate considérablement; il est d'abord droit, dans un certain parcours *(p_1)*, puis il se courbe vers le côté en forme d'U *(p_2)*, et continue de nouveau en ligne droite *(p_3)*, jusqu'à ce qu'il se recourbe brusquement en angle aigu pour suivre, jusqu'au canal déférent, la direction contraire *(p_4)*. La boucle en forme d'U *(p_2)* correspond certainement à la courbure de la fronde pénienne chez les genres *Chondrina* et *Abida*. Le canal déférent *(vd)* parcourt, après avoir dépassé le cloaque génital, une longue distance avant

de déboucher dans le pénis; il n'y est pas non plus rattaché bien solidement, en tout cas, pas à l'aide de muscles. Dans la partie proximale de son parcours il est situé entre l'oviducte libre et la région dilatée du pédoncule de la poche copulatrice. La portion extérieure du pénis, entre le cloaque génital et l'attache musculaire, présente, à l'intérieur, des plis transversaux, larges mais bas. L'appendice *(ap)* semble être la continuation directe de la partie pénienne extérieure, quoique ayant un lieu d'accès intérieur rétréci. Ce rétrécissement est formé par un pli transversal, creusé en cuiller, et dans la cavité duquel s'ouvre la partie pénienne proximale (p_1). Le pli transversal, linguiforme, s'avance de chaque côté sous l'aspect de deux longs plis parcourant toute la longueur de l'appendice. L'un de ces plis longitudinaux, l'externe, est droit et étroit, l'interne, haut, vigoureux et en forme de zigzag; c'est celui-ci qu'on distingue à travers la paroi. Entre les deux lamelles lisses s'observe une partie unie. Dans l'extrémité du cul-de-sac, les lamelles en zigzags s'affaiblissent et deviennent droites. Dans la région entre l'appendice et la boucle en forme d'U (p_2), la face intérieure est finement plissée, dans le sens de la longueur; la partie un peu dilatée, marquée p_3, est, du côté convexe, fortement épaissie, et munie intérieurement de nombreuses lames transversales. La dernière partie (p_4), avant d'arriver au canal déférent, présente une lumière assez grande, avec des parois irrégulièrement plissées ou garnies de verrues.

Musculature des organes génitaux: Le rétracteur pénien libre *(rp)* constitue une large bande extrêmement vigoureuse. Il se rattache, du côté proximal, au diaphragme, du côté distal, au pénis, à la limite entre la partie pénienne extérieure et l'appendice, comme nous venons de le dire; en effet, la paroi forme, à cet endroit, un pli tourné en dedans, sous le pli transversal en cuiller, ci-dessus mentionné, qui, intérieurement, constitue la limite entre les deux parties péniennes, et dans ce pli s'insère le rétracteur.

Le rapport du *retractor externus* et des conduits excréteurs des organes génitaux est également assez divergent de celui des formes décrites plus haut. Le rétracteur dextre est assez serré et compact. Par devant, il envoie, comme à l'ordinaire, des ramifications à l'ommatophore, au petit tentacule, et au lobe labial et parties environnantes, mais aucune branche n'est dirigée vers la partie extérieure du pénis. Le rétracteur de l'ommatophore court librement et ne

se rattache pas à ce dernier. A l'endroit où le rétracteur du petit tentacule se fixe, en général, au pénis, se trouve ici, à sa place, une bande conjonctive, dans laquelle sont logés le nerf *(np)* et les vaisseaux péniens; à cette bande s'en rattache une autre (de tissu conjonctif?), longue et étroite, et qui prend naissance au canal déférent, près de son lieu d'accès dans le pénis (×). Du côté ventral du rétracteur de l'ommatophore saillit une étroite bande musculaire qui va à la limite du pénis et du cloaque génital, ou plutôt à la région supérieure de ce dernier (ra_1), et encore plus du côté ventral, un autre muscle (ra_2), assez vigoureux, qui se fixe au cloaque génital dans toute la longueur de celui-ci. De la face interne de cette bande musculaire part une mince ramification allant au petit tentacule, et une autre, un peu plus large, se fixant à la lèvre et à la région située en avant du cloaque génital.

Chez Soós[62]), p. 62—63 et 146—147, fig. 38, se trouve une description et une figure de l'*Orcula dolium* Drap. Toutes deux correspondent bien — à part quelques différences assez peu importantes — aux résultats de mes recherches.

Deux autres espèces du genre dont nous nous occupons, *O. batumensis* Ret. et *O. orientalis* Parr., ont été étudiées par Wiegmann, et les résultats, avec des notes ajoutées, ont été publiés par P. Hesse[30]). Elles ont toutes deux, comme l'*Orcula dolium,* un appendice (appelé *caecum* par Hesse) au point d'attache du rétracteur, et en outre, à mi-chemin entre le caecum et le cloaque, un cul-de-sac supplémentaire, appelé «*appendix*». Ce dernier ne s'observe pas chez l'*Orcula dolium,* et Soós ne l'a pas trouvé non plus chez la seconde des espèces étudiées par lui, l'*Orcula doliolum* Brug. (l. c., p. 60 et 146, fig. 36). Une différence aussi grande exige — si l'examen a été exact, ce qui, certainement, ne peut pas être mis en doute — que les deux espèces orientales, étudiées par Wiegmann, soient classées dans un genre spécial. Hesse écrit, il est vrai (l. c., p. 12), que Wagner[79]), p. 120—21, a observé un «*appendix*» chez l'*Orcula,* mais que, selon toute vraisemblance, Soós*) ne l'a pas remarqué chez l'*O. doliolum.* Wagner ne parle cependant que d'un seul appendice sur le pénis et l'appelle simple-

*) Pour résoudre la question de l'appendice, Soós a examiné encore une fois, dans «Archiv f. Molluskenkunde» LVI, 1924, p. 169—171, les deux espèces *Orcula dolium* et *O. doliolum,* et il est arrivé au même résultat que dans ses recherches antérieures.

ment un diverticule. Il a certainement voulu indiquer par là le cul-de-sac situé à l'attache du rétracteur, qui se trouve chez toutes les espèces, et non pas précisément l'appendice distal (c. à. d. le plus proche du cloaque génital) de Wiegmann.

Lauria cylindracea Da Costa.

Pl. IX, fig. 1 et 2.

Des exemplaires étendus, provenant des falaises de l'île de «Møen», Danemark (juin-août 1912, 1922, Steenberg), et de France (Arcachon, avril 1920, Mlle E. Christensen), ont été examinés.

La glande hermaphrodite *(gh)* peut varier assez considérablement, tant pour le nombre des acini que pour les faisceaux. Chez quelques-uns des individus étudiés se voyaient deux faisceaux contenant chacun env. 10 acini allongés; chez l'exemplaire figuré (danois) on pouvait remarquer en outre un petit faisceau de 5 à 6 acini ayant une tendance à s'écarter des deux autres, qui comprenait chacun une dizaine d'acini.

Le canal hermaphrodite *(dh)* est assez court, droit au commencement, puis enroulé, d'abord légèrement et ensuite en formant des replis en zigzags, un peu plus serrés. La poche de fécondation est cachée dans la glande albuminipare; elle est longue, en forme de bâton, à l'extrémité légèrement courbée avec une dilatation vésiculaire, où aboutit la dernière partie, droite et courte, du canal hermaphrodite. La glande albuminipare est courte; sur sa face extérieure, convexe, se voit un sillon très profond dans lequel doit se loger l'intestin; on y aperçoit, en outre, une dépression produite par la partie inférieure du foie.

L'aspect du spermoviducte *(ov + pr)* diffère considérablement de celui des Pupillidae, ci-dessus décrits; l'animal étant ovovivipare, un certain nombre d'embryons sont toujours logés dans la partie supérieure de l'oviducte libre, développé en utérus *(ut)*. Celui-ci occupant beaucoup de place, le spermoviducte en est réduit d'autant, et devient ici extraordinairement court. Sa section femelle surtout *(ov)* se trouve diminuée; la prostate *(pr)* est un peu mieux développée, triangulaire, la pointe tournée en

bas, et dépasse par sa base large le bord inférieur de la glande albuminipare. Sur la prostate repose la vésicule de la poche copulatrice *(rs)*, mais à un endroit un peu variable; chez quelques exemplaires, sur son extrémité inférieure, chez d'autres, au milieu de sa surface.

La partie inférieure de l'oviducte libre *(ol)* est cylindrique et normalement développée, la partie supérieure est extrêmement grossie, jusqu'à former un utérus à parois très minces *(ut)*, celles-ci étant fortement dilatées par les embryons. Le moins développé est l'embryon supérieur, le plus, l'inférieur; cependant, la différence entre les degrés de formation n'est pas toujours très grande, dans certains cas ce n'est que par un examen plus minutieux qu'elle peut s'apercevoir. Le nombre d'embryons dans les divers individus étudiés s'est montré assez variable. Chez quelques-uns, qui possèdent un péristome bien développé, et qui ont été recueillis pendant l'été avec des exemplaires renfermant plusieurs embryons assez grands, on rencontre des organes génitaux sans embryons, et où l'utérus n'apparaît que comme un faible renflement transparent de la paroi, en haut sur l'oviducte libre. Chez d'autres on ne constate qu'un seul embryon, tout jeune, entouré d'une enveloppe (coquille d'œuf). Ce sont pourtant des exceptions. Pour la plupart des exemplaires estivaux, recueillis à «Møen» aux mois de juin-août, se trouvent 4 embryons dans chaque individu; mais on en rencontre aussi un plus grand nombre. Quelques spécimens français hibernants, provenant d'Arcachon, et recueillis au début du printemps, en renfermaient souvent 6 à 7; un exemplaire présentait même 1 embryon tout petit, 1 grand, entouré encore de son enveloppe, et 6 grands individus bien développés, les deux derniers ayant une coquille de 2 tours et demi.

Le long du côté concave de l'utérus courent deux bandes blanches qui se trouvent être, en y regardant de plus près, le canal déférent *(vd)* et le pédoncule de la poche copulatrice *(pd)*. Le canal déférent surtout adhère si fortement à l'utérus qu'on le considère, au premier coup d'œil, comme étant le canal séminal; toutefois il s'en détache assez facilement dans toute la longueur de ce parcours. Le vagin *(va)* est bien développé, d'une forme cylindrique; de sa région supérieure part le pédoncule de la poche copulatrice, dont la partie inférieure *(pd_1)* est fortement renflée; elle est de

plus grand calibre que la partie inférieure de l'oviducte libre. A l'endroit où commence l'utérus, le pédoncule se rétrécit assez brusquement, et il s'atténue encore plus vers le haut *(pd)*. La vésicule piriforme *(rs)* est nettement accusée.

Il n'y a guère de Pupillide qui puisse présenter un organe copulateur mâle aussi complexe que l'espèce dont nous nous occupons. La partie extérieure et vigoureuse du pénis est seulement un peu plus étroite que le vagin ; de là part un grand cul-de-sac complexe (*appendix*, *ap*), ainsi qu'une continuation plus étroite du pénis *(ép$_1$)*. La région proximale, grosse, du cul-de-sac *(ap)* ressemble beaucoup à l'appendice pénien chez l'*Orcula*, tant pour les dimensions que pour la position. Le cul-de-sac se fixe pourtant au pénis un peu plus du côté distal que chez cette dernière espèce ; il est plus étroit au lieu d'accès, plus large à l'extrémité opposée, à laquelle se rattache une branche du rétracteur pénien *(rp$_1$)*, et où débouche sa partie distale, plus étroite. Cette dernière, qui est très longue, se compose d'une région basilaire cylindrique, courte et plus large *(ap$_1$)*, et d'un cul-de-sac très long et étroit, à extrémité élargie peu à peu en forme de massue (*ap$_2$*). Ce cul-de-sac est logé dans son emplacement naturel le long de la partie inférieure de l'utérus qu'il traverse souvent de biais. Si l'on suit la seconde des branches résultant de la bifurcation du pénis, on rencontre d'abord une partie cylindrique *(ép$_1$)*, de la même longueur que la partie distale du pénis; puis une autre section cylindrique *(épiphallus, ép)* un peu plus longue, et courbée en forme d'U ; dans l'extrémité libre de cette dernière débouche le canal déférent. Le pénis est donc constitué par 3 parties : une partie distale qui touche au cloaque génital *(pé)*, une autre, proximale *(ép)*, auprès du canal déférent, et une troisième *(ép$_1$)* au milieu. Sur la limite entre les deux dernières aboutit un cul-de-sac cylindrique, bien développé *(flagellum, fl)*, et à celle du milieu *(ép$_1$)*, près du cul-de-sac mentionné en dernier lieu, se rattache la seconde branche du rétracteur pénien *(rp$_2$)*. Dans ce qui suit, nous appellerons le grand cul-de-sac entre la partie extérieure du pénis et celle du milieu, le cul-de-sac distal ou *appendix*, et l'autre, situé sur la limite entre les parties intérieure et moyenne, le cul-de-sac proximal ou *flagellum*. Un exemplaire jeune, mais à coquille entièrement développée, possédait un pénis incomplètement formé (pl. IX, fig. 2). Sur ce pénis,

le cul-de-sac distal *(ap)* ne présentait pas encore les trois parties différenciées, et le proximal n'était pas du tout formé, mais la figure nous montre comment ce flagellum doit être conçu. Le pénis décrit à cet endroit une courbe bien accentuée; c'est le nœud court ainsi formé, qui peu à peu se développe en cul-de-sac; le pénis tout développé porte encore des traces de cette manière de formation (comp. la forme). Le canal déférent (pl. IX, 1, *vd*) a un parcours assez long, avant d'arriver au cloaque génital, les parties proximale et distale du pénis ne se rencontrant pas. Il fait les trois quarts d'un tour sur la région proximale du pénis, s'enfonce dans la bifurcation pénienne et longe la partie distale; il court ensuite le long du vagin, passe au-dessous de celui-ci, et se replie sur le côté columellaire, où il se continue le long du pédoncule de la poche copulatrice et de l'utérus.

Le cloaque génital *(cl)* est extraordinairement court. Le rétracteur pénien *(rp)* naît des deux branches ci-dessus mentionnées. Ces branches accompagnent le long pédoncule appartenant au cul-de-sac distal, ainsi que l'utérus, et se réunissent à peu près à l'endroit où commence la massue de l'appendice (ap_2), à la hauteur du milieu de l'utérus. Le rétracteur est extrêmement long; il se fixe, comme à l'ordinaire, au diaphragme, mais à une partie située très haut dans la coquille, juste au-dessus de la région supérieure de l'utérus, et exactement au-dessous de l'anse intestinale qui entoure la glande albuminipare. La partie non bifurquée du rétracteur est située le long de l'œsophage.

Le rétracteur de l'ommatophore s'aperçoit, comme d'ordinaire, entre les sections mâle et femelle des voies d'excrétion; il est ici complètement dégagé du pénis. En somme, aucun muscle ne semble aller au pénis, ni du rétracteur du grand tentacule, ni de celui du petit. Par contre, une bande conjonctive, renfermant deux filaments blancs, le nerf pénien et un vaisseau, relie le ganglion cérébroïde à la partie distale du pénis et au canal déférent. Une ramification musculaire assez vigoureuse *(ra)* va du rétracteur externe au cloaque génital et à ses environs.

Moquin-Tandon[41]), p. 392, pl. 28, fig. 1, ainsi que Lehmann[33]), p. 141—142, pl. 13, fig. 48, ont décrit et figuré les organes génitaux du *Lauria cylindracea*. L'examen du spermoviducte est mal fait chez les deux, la structure complexe du pénis, au

contraire, a été assez bien rendue, surtout dans la figure de Moquin-Tandon. Sur cette dernière se voit aussi la réunion des deux branches du rétracteur pénien, fait que Lehmann n'a pas remarqué. L'aspect de la poche copulatrice est correct chez Moquin-Tandon, mais il est assez étrange que, dans sa reproduction des organes génitaux, il n'existe pas d'embryons dans l'utérus; nous venons de dire que c'est bien difficile de trouver des exemplaires développés où l'utérus n'en renferme pas. Toutefois, dans le texte (p. 391—92) il parle tant du nombre des embryons se rencontrant dans l'utérus, que de leur aspect. Chez Watson[80]) se trouvent quelques remarques sur la prostate et sur les spermatozoïdes. Il indique (p. 18) que la prostate est ici du même type que celle qui a été constatée par moi chez les genres *Acanthinula* et *Vallonia*, et que les têtes des spermatozoïdes, enroulées en spirales, sont exactement analogues à celles du genre *Pyramidula*.

Pupilla muscorum L.

Pl. X, fig. 1—3.

D'après des individus recueillis dans diverses localités du Danemark. Les exemplaires étendus, d'après lesquels sont dessinées les figures, proviennent de Seeland («Nøddebo», août 1920).

La glande hermaphrodite *(gh)* ne contient qu'un nombre d'acini étonnamment petit. Sa forme est conique ou pyramidale, et on peut distinguer deux faisceaux mal délimités, dont l'apical renferme 7 acini, l'autre 6. Ceux-ci sont jaunâtres, courts et assez larges, entourés d'un tissu conjonctif pigmenté.

Le canal hermaphrodite *(dh)* est droit dans sa première partie, lâchement enroulé dans la partie moyenne et faiblement sinueux dans la dernière. La poche de fécondation *(pf)* est droite et assez étroite; la dernière portion du canal hermaphrodite est tellement fine et si étroitement serrée contre la poche de fécondation que seul un examen minutieux fait découvrir qu'elle ne débouche pas dans la partie inférieure de celle-ci. La glande albuminipare *(ga)* se compose de plusieurs acini courts, de forme cylindrique ou prismatique, dont la lumière intérieure est assez grande.

Le spermoviducte est autrement construit que chez les *Lauria*. Si on prend comme point de départ le lieu d'accès du canal dé-

férent situé au-dessous de l'utérus *(ut)*, le spermoviducte paraîtra long, et l'utérus sera alors uniquement formé par la région femelle du spermoviducte et non pas par la partie supérieure de l'oviducte libre. Les conditions de structure étant, à cela près, les mêmes chez les *Lauria* et les *Pupilla,* il serait apparemment plus naturel d'expliquer «l'utérus» chez les *Lauria* de la même manière qu'ici, et de supposer que le canal séminal du spermoviducte s'est dégagé et a pris le même caractère que le canal déférent, dont il apparaît alors comme la continuation immédiate; mais la différence de conformation intérieure dans les spermoviductes des deux espèces témoigne contre cette opinion. L'utérus monte très haut, car même la partie située à la hauteur de la prostate, renferme en général des embryons, si le reste de l'oviducte en est rempli. Le nombre d'embryons qui s'y rencontre le plus souvent est de 4. Les individus étudiés, recueillis au mois d'août, contenaient des embryons plus grands, dont les plus âgés possédaient une coquille à deux tours entiers. Il est relativement difficile de les distinguer nettement à travers la paroi, bien que celle-ci ne soit pas très épaisse; cela est dû au fait qu'elle renferme une certaine quantité de pigment noir, disposé en fines rangées transversales, en bandes ou en séries de points, excepté à un seul endroit où se voit une bande longitudinale blanche: le canal séminal *(cs)*. La région la plus élevée de l'oviducte constitue une grande chambre d'albumine, arrondie; dans la figure, la plus grande partie en est cachée par la prostate *(pr)*. Celle-ci forme un triangle, composé de très grands acini blancs. Quelquefois l'extrémité inférieure pointue fait défaut. L'oviducte libre *(ol)* est très long, plus long que le vagin *(va)*; les deux forment, dans toute leur longueur, un tube cylindrique, un peu aplati seulement au lieu d'accès de la poche copulatrice.

Celle-ci diffère des genres précédents par le fait qu'il existe ici un diverticule *(di)* sur le pédoncule. Ce dernier se bifurque, en effet, vers le haut; l'une des deux branches, l'étroite *(di)*, qui forme la continuation du pédoncule, est plutôt située sur la face supérieure du spermoviducte; l'autre *(rs)*, plus distinctement séparée du pédoncule, est souvent un peu dilatée en forme de massue et placée sur le côté inférieur du spermoviducte. Il est assez difficile de trancher la question de savoir laquelle des deux doit

être considérée comme vésicule terminale et laquelle comme diverticule, vu surtout que des spermatophores ou des restes de spermatophores se trouvent souvent dans la partie la plus étroite (pl. X, fig. 3). A cause de la position et de l'aspect nous désignerons ici la partie dilatée en massue comme vésicule de la poche copulatrice, et le tube étroit, situé sur le côté supérieur de l'oviducte, comme diverticule. Le plus souvent la vésicule et le diverticule sont à peu près de la même longueur (pl. X, fig. 1 et 3), dans quelques cas pourtant, une vésicule un peu plus longue a été observée (pl. X, fig. 2). Le pédoncule est étroitement serré contre l'oviducte libre et, plus vers le haut, contre la région inférieure du canal séminal, entre celui-ci et le muscle columellaire. Il est souvent difficile de le préparer. On constate l'existence d'un cloaque génital bien marqué et nettement délimité *(cl).*

Le long pénis ressemble beaucoup, dans sa structure, à celui du genre *Lauria.* Si nous le suivons dans son parcours, depuis le cloaque génital jusqu'au canal déférent, nous apercevrons les sections suivantes: d'abord une partie grosse et courte *(pé)*, qui se bifurque en formant la section pénienne moyenne *(ép$_1$)* et un très grand cul-de-sac (le cul-de-sac distal, *appendix*, *ap*). Toutefois, les conditions sont telles que l'appendice *(ap)* se trouve en prolongation de la partie pénienne distale *(pé)*, et paraît en former la continuation directe, tandis que la section moyenne du pénis *(ép$_1$)* a plutôt le caractère d'une ramification latérale; l'appendice *(ap)* possède une forte région basilaire, cylindrique, qui, à l'extrémité, porte un renflement *(ap$_1$)*, d'où part la longue et étroite partie extérieure, en forme de massue *(ap$_2$)*. Sur le renflement sphérique s'insère l'une des branches du rétracteur pénien *(rp$_1$)*. La section moyenne du pénis *(ep$_1$)* se termine par un gros cul-de-sac tout court (le cul-de-sac proximal, *flagellum*); la troisième et dernière section *(ép)* est, au début, très étroite, et à cette partie se fixe la seconde branche du rétracteur pénien *(rp$_2$)*, puis elle décrit une grande boucle en forme d'U, dans l'extrémité arrondie de laquelle débouche le canal déférent. La partie distale *(pé)* est certainement à considérer comme le pénis proprement dit, les deux autres parties (*ép$_1$*, *ép*, ou peut-être la dernière seule), comme l'épiphallus. Le long appendice à pédoncule du cul-de-sac distal *(ap$_2$)* s'étend, quand l'animal est dans l'état d'extension, par-dessus la nuque, parcourt

le commencement du premier tour de l'animal, au-dessus de l'œsophage, et se replie sur le côté gauche de celui-ci, pour le suivre ensuite dans une certaine longueur.

Le canal déférent *(vd)* qui, dans toute son étendue, est étroit et homogène, court, sans être rattaché au pénis, jusqu'à l'angle entre ce dernier et le vagin, puis il décrit à peu près le tour entier de celui-ci, pour continuer ensuite en ligne droite jusqu'au canal séminal.

Il est assez caractéristique que le rétracteur externe, avec ses ramifications allant à l'ommatophore, au petit tentacule et au lobe labial, ne représente pas la moindre liaison avec le cloaque génital et le pénis. Le rétracteur pénien *(rp)* naît des deux branches déjà mentionnées, qui se réunissent assez vite en un seul tronc court, situé entre l'oviducte et l'œsophage. Il se rattache au diaphragme *(dp)*, sur l'animal étendu à une distance égale à un quart de tour du péristome, et il est, comme le diaphragme, pigmenté de fines raies sombres, tracées dans tous les sens.

Moquin-Tandon[41]), p. 394, et [40]), p. 225—226, n'a aucune étude anatomique sur les organes génitaux de cette espèce, mais il donne, au contraire, des indications sur l'aspect des œufs et des embryons renfermés dans l'utérus, sur leur nombre et sur leur dimension. La description et la figure de Lehmann[33]), p. 145, pl. 14, fig. 50, sont un peu incomplètes et, sur plusieurs points, inexactes. Il n'a pas remarqué l'une des branches du rétracteur pénien ainsi que le diverticule de la poche copulatrice, et cette poche ne présente jamais l'aspect décrit et figuré par lui. Il a mieux réussi pour la structure pénienne.

Wiegmann[86]), p. 248, a quelques remarques sur le *Pupa muscorum*; il nous informe ainsi du fait qu'il se trouve un diverticule sur la poche copulatrice (tandis qu'un pareil organe fait défaut chez les *Pupa frumentum*, *secale* et *avenacea*), et que le pénis possède un appendice en forme de massue comme chez les différents *Buliminus*.

Pupilla triplicata Stud.

Pl. XI, fig. 1—3.

Exemplaires étendus provenant de «Sterzing», col du Brenner, 950 m d'altitude; recueillis le 6 août 1912 par D. Geyer.*)

La glande hermaphrodite *(gh)* est, comme c'est l'ordinaire dans le genre *Pupilla*, petite, comprimée, et composée de 7 à 8 acini, de longueur moyenne, mais sans indication d'une disposition en faisceaux. Les acini ont chacun la forme d'une massue, entourée au sommet d'un réseau de pigment noir.

La première partie droite du canal hermaphrodite *(dh)* est un peu pigmentée, de couleur grise; la moyenne est ici blanchâtre et avec de petits replis en zigzags; la dernière portion est courte et en partie cachée dans la glande albuminipare.

La poche de fécondation *(pf)* est de longueur moyenne, assez grosse et courbée à l'extrémité. En bas, elle descend nettement jusqu'à la première région du spermoviducte qui constitue une chambre blanche (la chambre de l'albumine). La glande albuminipare *(ga)* est blanchâtre, non pigmentée, grise et à moitié transparente, avec des acini assez semblables. La prostate *(pr)* est extraordinairement petite, formant une partie triangulaire avec de tout petits acini gris. L'utérus *(ut)* est long, fortement développé, avec trois grands embryons dans l'individu disséqué. Le canal séminal apparaît sur le côté concave comme une bande blanche, plate. La région inférieure de l'utérus est assez fortement renflée, surplombant la partie proximale de l'oviducte libre *(ol)*. Celui-ci et le vagin *(va)* sont à peu près de la même longueur. Le pédoncule de la poche copulatrice (fig. 2, *pd*) est un peu épaissi à sa base, vers le haut il s'atténue et court le long de l'oviducte libre en se continuant aussi jusqu'à une certaine hauteur sur l'utérus, où il se divise et forme la vésicule principale *(rs)* et l'étroit diverticule

*) C'est à D. Geyer, qui en 1912 se chargea si aimablement de me recueillir des matériaux, que je suis redevable d'avoir pu étudier tant d'espèces des *Pupilla*; je les ai décrites ici, à une seule exception près, peu importante, sous les noms indiqués par lui. La question de la systématique du genre *Pupilla* sera examinée plus tard dans un travail se basant en partie sur les études anatomiques présentes, et sur plusieurs autres, je l'espère, en partie sur de nouveaux examens des coquilles.

(di), un peu plus long seulement que la vésicule. L'extrémité du diverticule est presque à égale distance des deux extrémités de l'utérus (fig. 1). Le cloaque génital *(cl)* est relativement long. Le pénis présente les parties ordinaires; le cul-de-sac distal avec son diverticule *(ap_2)* est très fortement développé, le proximal est petit, en forme de doigt et serré contre la région distale, étroite, de la section pénienne intérieure. A l'extrémité distale du canal déférent se rattache une bande, qui d'abord accompagne celui-ci vers le cloaque génital, puis, après l'avoir contourné, se réunit avec le nerf pénien *(np)*; cette bande est formée sans doute de tissu conjonctif et renferme une ramification du nerf pénien; ce dernier envoie en outre une branche au pénis et une autre à la partie comprise entre le pénis et le cloaque génital; cette dernière ne se trouve pas dessinée dans la figure.

La vésicule terminale du cul-de-sac distal *(ap_2)* traverse la nuque, se recourbe vers le côté droit, jusqu'au-dessous de l'orifice respiratoire, puis monte au milieu du dernier tour le long du rétracteur pénien (fig. 3). Comme ce dernier elle passe par-dessus de l'œsophage. Le rétracteur pénien *(rp)* est très vigoureux; la branche latérale allant à la partie proximale du pénis *(ép)* est extrêmement courte et large.

Pupilla bigranata Rossm.

Fig. 16 *A* et *B* du texte.

Exemplaires étendus, provenant d'Allemagne (Loreley, septembre 1912, D. Geyer).

La glande hermaphrodite ne constitue qu'un seul faisceau, renfermant 11 acini environ. La portion moyenne du canal hermaphrodite forme comme un peloton court, mais gros et à replis étroitement serrés. La première partie seule de ce canal est pigmentée. La glande albuminipare est grande; elle présente, à l'extrémité, une entaille, et sur la face externe, des sillons profonds dans lesquels vient se placer la grande anse extérieure de l'intestin. Toute la surface libre de la glande est couverte d'une couche calcaire. La poche de fécondation est analogue à celle de l'espèce précédente; la prostate, au contraire, qui se compose d'acini assez grands et grossiers, est plus fortement développée, plus large en haut, se

rétrécissant vers le bas, et sa masse principale se trouve située sur le côté extérieur; elle se joint assez exactement à la base de la glande albuminipare, mais les deux glandes se distinguent facilement, la prostate étant jaune, la glande albuminipare, blanche. La

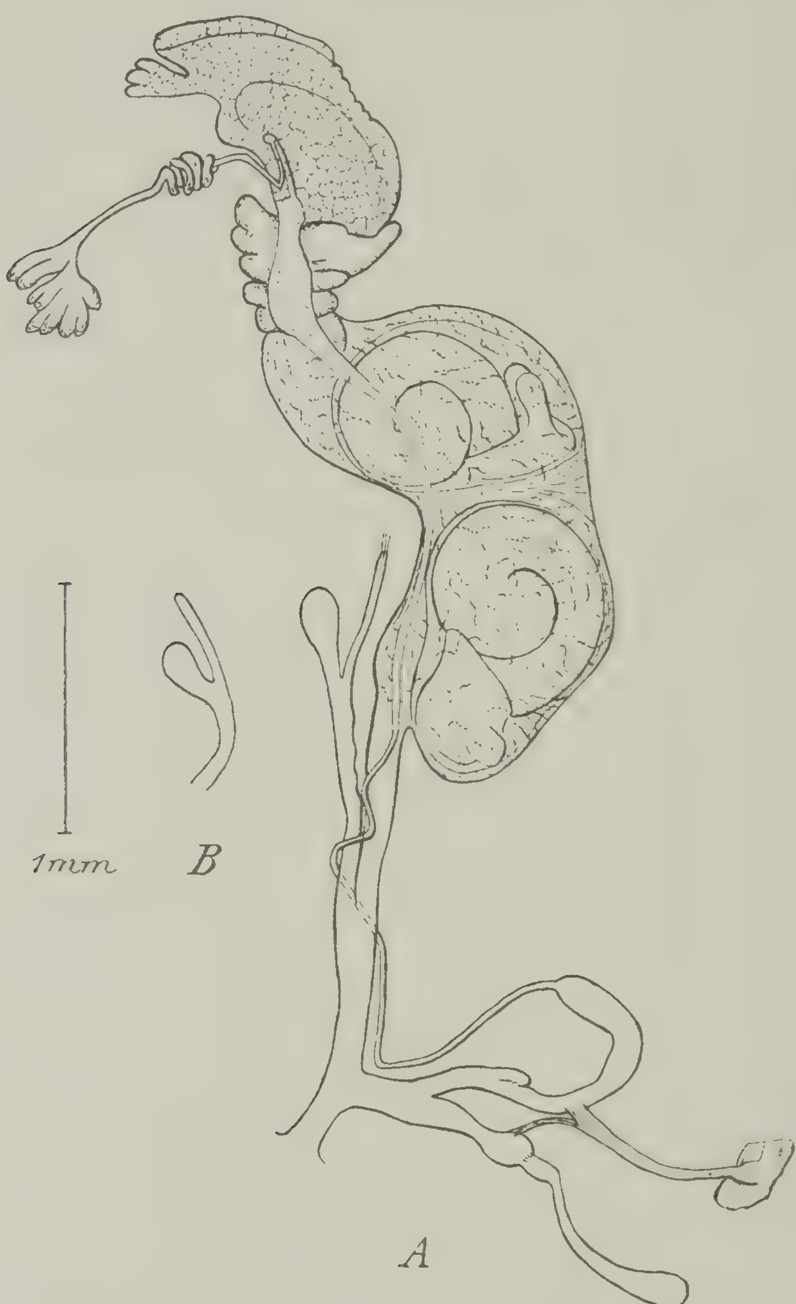


Fig. 16 *A*. Organes génitaux de *Pupilla bigranata* Rossm., vus par dessus, la partie supérieure un peu plus du côté columellaire. La poche copulatrice a été préparée isolément. — *B*. Poche copulatrice d'un autre individu.

prostate est extérieurement convexe, intérieurement concave. Dans cette concavité est logée la partie proximale de l'oviducte, et celle-ci, étant de couleur grise et à parois minces, se dessine nettement contre la prostate jaune.

La paroi utérine est extraordinairement mince, à pigmentation très clairsemée, formée de fins points disposés en lignes. Il existe,

en général, 2 embryons dans l'utérus, rarement un seul, et une fois l'auteur en a constaté trois. Par un éclairage oblique se voit le long du côté columellaire de l'utérus, une étroite bande blanchâtre, à reflet soyeux, dans l'extrémité inférieure de laquelle aboutit le canal déférent; c'est le canal séminal. Celui-ci est toujours assez difficile à reconnaître chez les petites formes possédant un utérus.

L'oviducte libre et le vagin sont cylindriques et à peu près de la même longueur; à la limite qui les sépare prend naissance un tube plus étroit, qui, sur les exemplaires fixés, était complètement aplati et semblable à un ruban; c'est la poche copulatrice. Le pédoncule ainsi que la vésicule sont toujours assez accusés, tandis que le diverticule se trouve, dans sa position normale, être serré contre le canal séminal, et couvert par le muscle columellaire; de même ses parois sont si minces que ce n'est souvent qu'à l'aide d'une coloration et après un examen très minutieux qu'on réussit à en constater les limites et la lumière. La vésicule est courte, le diverticule un peu plus long et étroit (fig. 16 *B*). Chez quelques individus, dont le pénis n'était que faiblement développé, se trouvait, dans le pédoncule et la vésicule, un corps clair, cartilagineux, probablement le spermatophore, mais qui, pourtant, n'était pas assez bien conservé pour qu'on puisse le reconnaître avec certitude.

Le cloaque génital est bien développé. Le canal déférent et le pénis ont un parcours et une conformation qui correspondent assez exactement à ceux du *Pupilla muscorum*; seulement la longue vésicule, en forme de massue, du cul-de-sac pénien distal, ainsi que la partie moyenne du pénis, sont plus courtes que chez cette espèce. Sur l'animal étendu, la vésicule se voit à gauche de la fronde pénienne, passant par-dessus les glandes salivaires. Le rétracteur pénien est l'unique muscle en relation avec les organes génitaux. Il se fixe au diaphragme, dans le milieu de celui-ci et sur la face supérieure du dernier tour, c'est-à-dire à une distance du collier palléal qui ne dépasse guère 90°. Il est situé en dedans de la fronde pénienne.

Pupilla cupa Jan var. (?) *sterri* Voith.

Pl. XII, fig. 1 et 2; pl. XIII, fig. 4; pl. XXVI, fig. 3 et 4.

Individus étendus, provenant de «Olgafelsen» (Allemagne) et recueillis le 22 septembre 1912 par D. Geyer.

La glande hermaphrodite *(gh)* est très petite, blanche ou blanc jaune, revêtue comme d'un voile de pigment disposé en mailles fines. Sur l'exemplaire figuré on distinguait 2 faisceaux, l'apical contenant 4 acini, l'autre 6—7. La première partie du canal hermaphrodite est longue et fortement pigmentée; la partie tortueuse *(dh)* présente, outre plusieurs replis de moindre dimension, un seul qui est particulièrement gros et grand.

La poche de fécondation *(pf)* est petite et d'une structure semblable à celle du *P. muscorum.* La prostate *(pr)*, qui constitue un triangle court, se compose de grands acini d'un blanc jaune. La paroi utérine *(ut)* s'épaissit dans la partie proximale, s'amincit dans la partie inférieure plus grande; la pigmentation et l'aspect du canal séminal sont comme chez l'espèce précédente. L'utérus renferme de 1 à 3 embryons, le plus souvent 2 (pl. XIII, fig. 4). Le vagin *(va)* et l'oviducte libre *(ol)* sont tous deux assez longs, particulièrement ce dernier. Par conséquent, le pédoncule de la poche copulatrice devient également long (pl. XXVI, fig. 3, *pd*); celui-ci est, surtout dans sa région inférieure, fortement développé et bien délimité. A la hauteur de l'extrémité inférieure de l'utérus, il se divise en deux: la vésicule terminale *(rs)* et le diverticule *(di).* La vésicule est, chez quelques exemplaires, assez nettement distincte du pédoncule qui, dans ce cas, paraît se continuer directement dans le diverticule (pl. XXVI, fig. 3). La vésicule se trouve sur le côté concave de l'oviducte; le diverticule monte le long du canal séminal jusqu'à la moitié de la hauteur de l'utérus, et dans un seul cas, jusqu'aux trois quarts. Les figures 3, 4, pl. XXVI, et la planche XII montrent quatre aspects différents de la poche copulatrice. Le pénis ressemble encore plus à celui du *P. muscorum* que chez l'espèce précédente, la vésicule terminale du cul-de-sac distal *(ap_2)* étant extrêmement longue. La partie moyenne du pénis *($ép_1$)* présente des parois assez minces, de façon qu'on en distingue du dehors les plis longitudinaux intérieurs; ces plis parais-

sent se continuer dans le cul-de-sac proximal, pointu et semblable à un doigt. Le rétracteur pénien est très court.

Pupilla cupa Jan.

Pl. XIII, fig. 1—3; pl. XIX, fig. 3.

Exemplaires provenant de «Schlern» (Alpes dolomites du Tyrol méridional), 2200 m d'altitude, recueillis par D. Geyer le 16 août 1912. Trois individus étendus ont été examinés.

Cette espèce est, pour la plupart des caractères anatomiques, étroitement apparentée au *P. sterri;* toutefois, les acini de la glande hermaphrodite *(gh)* sont de forme plus élancée, bifurqués, et la partie tortueuse du canal hermaphrodite *(dh)* est plus longue. L'un des exemplaires étudiés avait l'utérus *(ut)* et la prostate *(pr)* fortement pigmentés; cette dernière était presque complètement noire, et même entre les acini de la glande albuminipare *(ga)* se voyaient plusieurs granules de pigment noir. Il se constate de 2 à 4 embryons dans l'utérus. La poche copulatrice (les trois individus examinés sont figurés) présentait une vésicule *(rs)* assez grande et bien accusée, et un diverticule *(di)* très long, qui, chez un des individus, atteignait presque la prostate, mais qui, chez les autres, s'arrêtait après être monté jusqu'aux trois quarts de la hauteur de l'utérus; il était facile à suivre, étant bordé de pigment noir.

Le pénis $(pé + ép_1 + ép)$ est semblable à celui du *P. sterri,* mais avec un aspect plus jeune, ce qui tient peut-être à ce que les exemplaires étudiés n'étaient pas tout à fait développés au point de vue de la voie d'excrétion mâle. La vésicule en forme de massue du cul-de-sac distal (ap_2) est plus courte que chez le *P. sterri,* et le cul-de-sac proximal fait quelquefois complètement défaut ou bien il est rudimentaire. La partie du canal déférent située entre le pénis et le cloaque génital est courte.

Pupilla madida Gredler.

Fig. 17 *A*, *B* et *C* du texte.

Exemplaires étendus provenant de «Salten», près de Bozen, Tyrol méridional. Commencement d'août, 1912. Recueillis par D. Geyer.

Les deux individus examinés sont assez différents au point de vue du développement de l'utérus et du pénis, de même que les diverticules de la poche copulatrice sont de différente longueur.

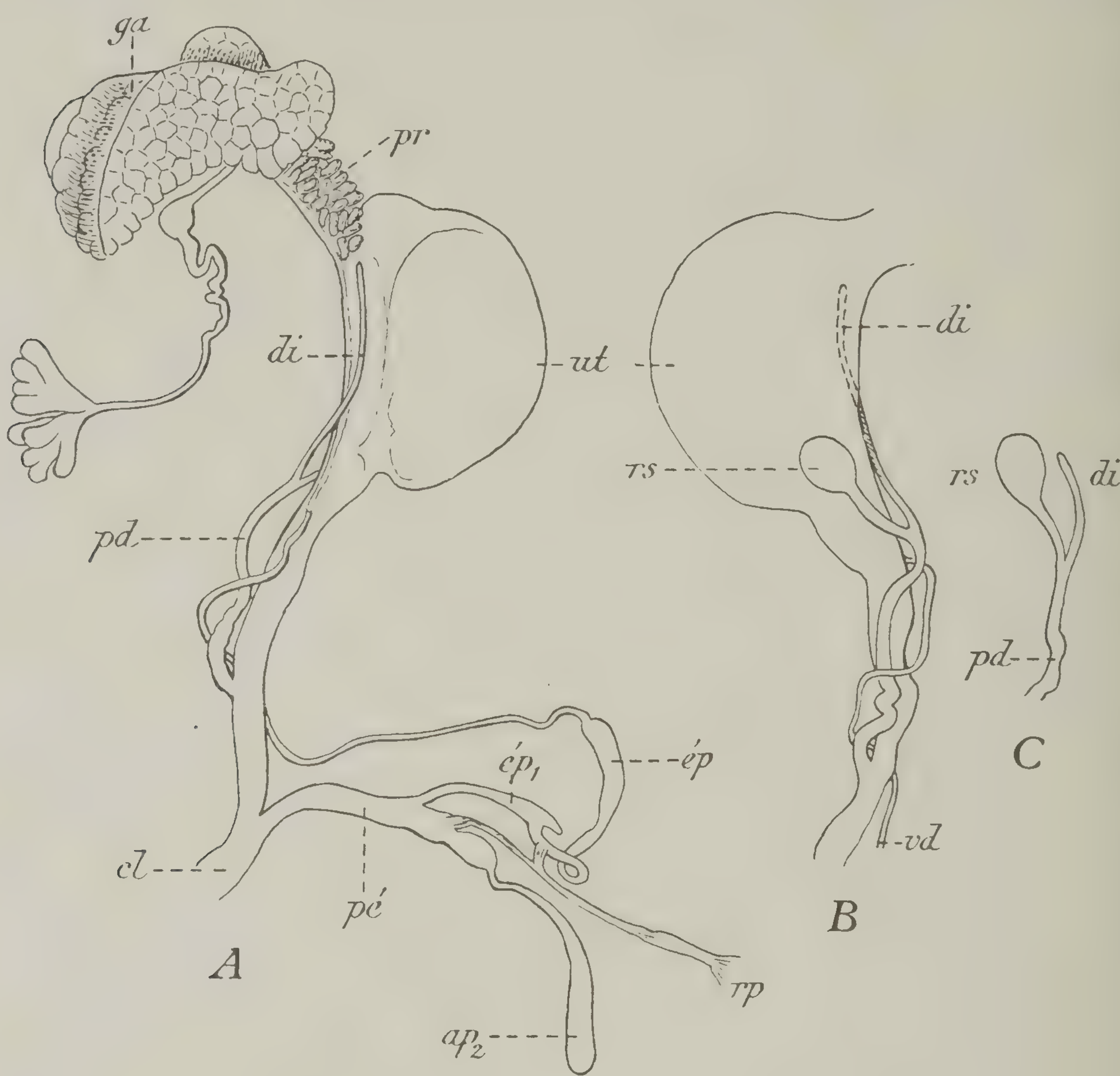


Fig. 17 *A.* Organes génitaux de *Pupilla madida* Gredl., vus par la face supérieure. — *B.* Partie de ceux-ci vue par la face inférieure. — *C.* Poche copulatrice d'un autre individu. — *ap₂*, cul-de-sac distal du pénis ; *cl*, cloaque génital ; *di*, diverticule de la poche copulatrice ; *ép*, *ép₁*, parties proximale et moyenne du pénis ; *ga*, glande albuminipare ; *pd*, pédoncule de la poche copulatrice ; *pé*, partie distale du pénis ; *pr*, prostate ; *rp*, rétracteur pénien ; *rs*, vésicule de la poche copulatrice ; *ut*, utérus ; *vd*, canal déférent.

L'exemplaire le plus long offrait l'aspect suivant : La glande hermaphrodite est assez fortement pigmentée. Le canal hermaphrodite est entièrement noir dans sa première partie, tandis que la partie enroulée est enveloppée comme d'un réseau de pigment. La poche de fécondation est courte et blanche. La glande albuminipare *(ga)* est courte, avec une pigmentation noire entre les acini et de profonds sillons où se loge l'anse extérieure de l'in-

testin. La prostate *(pr)* est tout à fait noire et de forme triangulaire. L'utérus *(ut)* est considérablement développé, avec 4 grands embryons et des plis profonds dans la paroi entre chaque embryon. Cette paroi est fortement pigmentée en dessin réticulaire.

La poche copulatrice (fig. 17 *C*) se compose d'un pédoncule *(pd)* assez large et vigoureux et d'une vésicule *(rs)* relativement grande, piriforme, qui, vers le bas, se continue en une queue très ténue, aboutissant, avec le fin et étroit diverticule, dans le pédoncule mentionné. Le diverticule est un peu plus court que la vésicule. Cette dernière est située d'un côté du canal séminal, le diverticule de l'autre, longeant ce canal. Si les organes génitaux sont placés, la glande albuminipare en haut et le cloaque génital en bas, tandis que le canal séminal est tourné vers l'observateur, la vésicule de la poche copulatrice se trouvera du côté gauche et le diverticule du côté droit.

Le pénis présente la conformation ordinaire, mais chez l'individu que nous venons de décrire, il n'était pas complètement développé.

Le second individu (fig. 17 *A* et *B*) possédait un pénis fortement développé et un diverticule *(di)* très long sur la poche copulatrice. Ce diverticule monte tout à fait jusqu'à la prostate.

Vertigo moulinsiana Dupuy.

Pl. XIV, fig. 1; pl. XV, fig. 1—3; pl. XVI, fig. 1—3; fig. 18 *A* et *B* du texte.

D'après des exemplaires étendus, provenant des bords du «Furesø» et de la «Mølleaa», Danemark, et recueillis par l'auteur pendant les mois de juin à novembre.

La glande hermaphrodite (fig. 18 *A*, *gh*) ressemble à une partie d'une grappe de raisin, les acini étant globulaires et bien distincts l'un de l'autre. On remarque, chez la plupart des exemplaires, 2 faisceaux d'acini, reliés entre eux par un conduit court; l'un des faisceaux renferme env. 6 acini, l'autre 12. Ceux-ci sont d'un blanc jaune et revêtus de tissu conjonctif, renfermant une certaine quantité de pigment noir; ils sont placés sur des pédoncules tout courts.

Le canal hermaphrodite *(dh)* est très fortement pigmenté, presque noir; il est assez court et la partie moyenne n'en est pas très tortueuse.

La poche de fécondation (fig. 18 du texte et pl. XV, fig. 1, *pf*) est très longue, située à découvert et non pas cachée dans la glande albuminipare *(ga)*, mais visible le long du bord interne, concave, de celle-ci. La moitié descendante (distale) est assez grosse; l'ex-

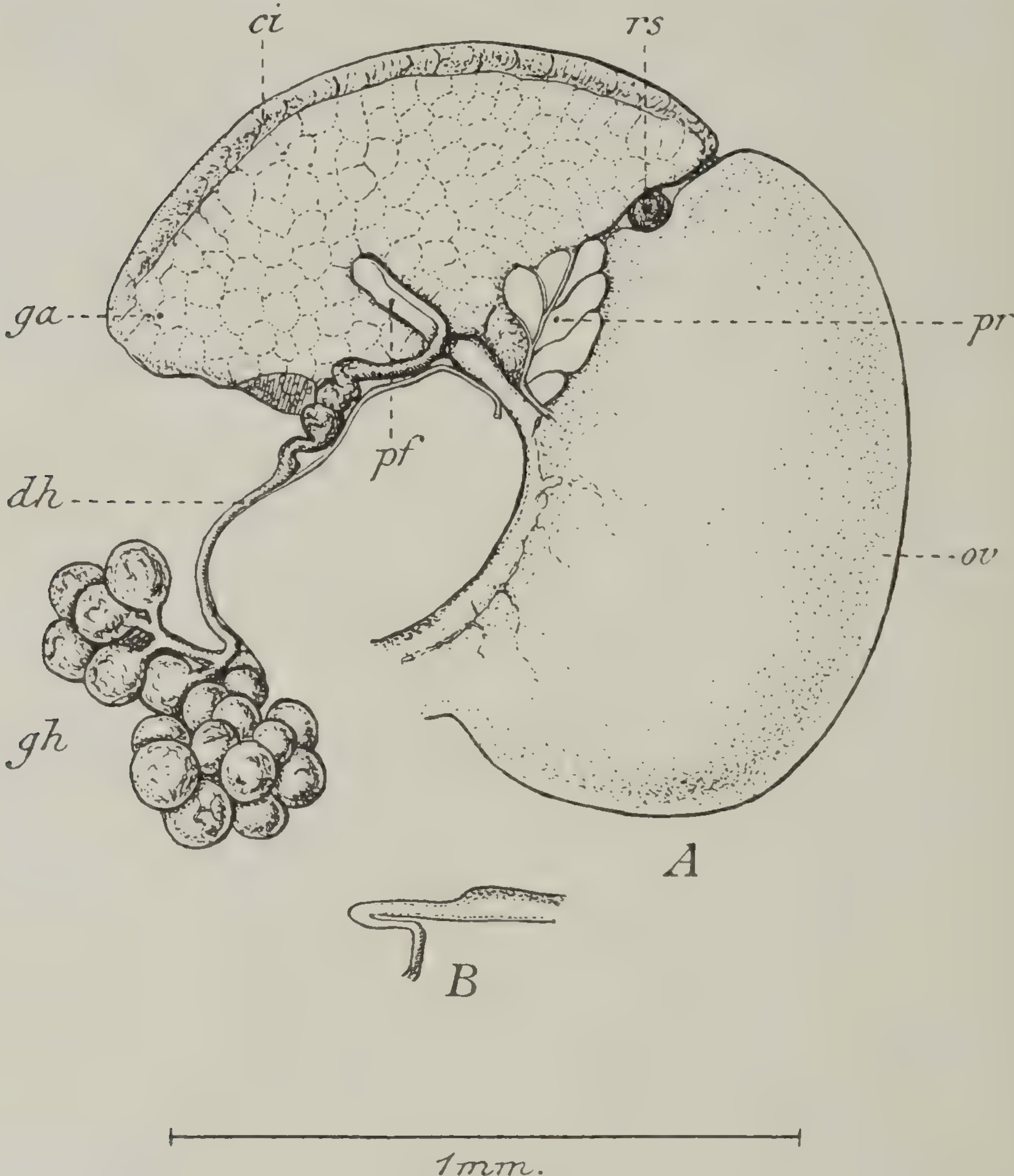


Fig. 18 *A*. Partie supérieure (proximale) des organes génitaux chez *Vertigo moulinsiana*. — *ci*, emplacement de l'intestin; *dh*, canal hermaphrodite; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ov*, oviducte; *pf*, poche de fécondation; *pr*, prostate; *rs*, vésicule de la poche copulatrice. — *B*. Poche de fécondation d'un autre individu.

trémité de la partie supérieure, mince, se prolonge assez insensiblement dans la dernière partie du canal hermaphrodite; celle-ci est étroitement pressée contre la poche de fécondation et placée tantôt du côté externe de cette poche, tantôt du côté interne (fig. 18 *B*). La poche même est blanche; mais un vaisseau noir, pigmenté, la suit dans toute sa longueur et se continue le long du canal hermaphrodite. La glande albuminipare *(ga)* est grande, en

forme de langue, à section transversale triangulaire; les acini sont grands et finement bordés de pigment.

Le spermoviducte *(ov + pr)* est gros et court. L'oviducte *(ov)* est constitué par un grand sac grisâtre, concave du côté intérieur, columellaire, fortement bombé du côté extérieur. Les parois sont très épaisses, à moitié transparentes et d'une consistance gélatineuse; elles se dilatent considérablement dans l'eau et c'est pourquoi il faut toujours plonger les animaux dans l'alcool pour les disséquer. Les formations compliquées de plis que nous connaissons par l'*Abida,* le *Chondrina,* le *Sandahlia,* et d'autres genres, font ici complètement défaut. A un endroit seulement s'aperçoit une dépression d'une plus grande profondeur, mais dans le sens de la longueur; elle commence dans la partie inférieure du spermoviducte comme une rainure peu marquée, qui s'approfondit en montant; elle ne s'arrête pas à la glande albuminipare, mais se continue comme un sillon entre la base de celle-ci et la partie proximale de l'oviducte (pl. XV, fig. 2 et pl. XVI, fig. 1). Ce sillon est principalement situé sur la face inférieure de l'oviducte, limité du côté intérieur, vers la columelle, par le canal séminal, et du côté extérieur, par la région renflée, saillante, du sac de l'oviducte. Ce n'est que la partie supérieure du sillon qui arrive jusque sur la face extérieure du tour. Dans le sillon se trouve logée la poche copulatrice *(rs* et *pd),* et son fond s'élève fortement en voûte, saillant dans la lumière de l'oviducte, de façon que celle-ci se présente, vue en section transversale, comme courbée en forme de croissant (pl. XVI, fig. 2).

Le canal séminal (pl. XV, fig. 1, 2 et pl. XVI, fig. 1, *cs*) longe le bord columellaire de l'oviducte. La prostate *(pr)* est toute petite, placée sur la face supérieure du spermoviducte et tout à fait à la limite entre la glande albuminipare et l'oviducte. Elle forme dans la plupart des cas, une figure semblable à une feuille, composée de 6 à 7 acini disposés à peu près symétriquement en deux rangées longitudinales (pl. XIV, fig. 1; fig. 18*A* du texte). Chez quelques exemplaires une des rangées seulement, comprenant 3 ou 4 acini, s'était développée (pl. XV, fig. 1 et 3).

Sur les côtés inférieur et extérieur du tour, la poche copulatrice (pl. XV, fig. 2 et pl. XVI, fig. 1, *rs*) se trouve logée dans le sillon longitudinal, ci-dessus mentionné. Le pédoncule *(pd)* est extrêmement

mince, un peu dilaté seulement juste à l'endroit de sa naissance. La vésicule *(rs)* est piriforme; chez un seul individu (pl. XIV, fig. 1) elle était plus allongée, presque en massue. Elle monte quelquefois si haut qu'on en voit l'extrémité sur la face supérieure, à la base de la glande albuminipare (fig. 18 *A* du texte, *rs*). Le pédoncule ainsi que la vésicule sont gris, très finement pigmentés. Tout l'oviducte libre *(ol)* est blanc, et se distingue assez nettement de la section femelle, grisâtre, du spermoviducte. La structure intérieure de la partie supérieure de l'oviducte libre (pl. XVI, fig. 3), est à peu près analogue à celle du *V. antivertigo*; les détails en seront exposés pour cette espèce.

Le canal déférent *(vd)* part du canal séminal à la limite entre la section femelle, grise, du spermoviducte et l'oviducte libre, blanc. Il suit ce dernier et le vagin jusqu'au cloaque génital, tout en décrivant de faibles sinuosités. Dans la bifurcation, où se réunissent les conduits excréteurs mâle et femelle, il est rattaché à la partie supérieure du cloaque génital à l'aide d'un nerf et de plusieurs filaments conjonctifs qui passent à cet endroit. Le reste, assez long, du canal déférent forme avec le pénis une fronde extrêmement longue. Chez un des exemplaires étudiés (pl. XV, fig. 1, *vd*), la première moitié de cette partie du canal déférent, comprise dans la fronde, était épaissie. Le rétracteur pénien *(rp)* se fixe à côté de l'endroit où le canal déférent débouche dans le pénis. Celui-ci *(pé)* est long et de même nature partout. La différence de calibre entre les diverses régions du tube est très peu considérable; cependant, chez tous les individus examinés dans l'état d'extension, la partie du milieu semble être la plus forte; chez certains, la lumière de cette région peut se distinguer à travers la paroi comme une raie légèrement courbée en zigzag (pl. XV, fig. 1). La paroi du pénis est épaisse, celle du canal déférent, au contraire, est mince.

Le nerf pénien (pl. XV, fig. 1, *np*) est très visible; il saillit du ganglion cérébroïde, près de l'endroit d'où part le connectif cérébro-buccal; après avoir envoyé une branche latérale, toute petite, au canal déférent, il se fixe à la base du pénis. Le rétracteur de l'ommatophore est situé entre les parties distales des conduits excréteurs mâle et femelle. La branche antérieure du rétracteur externe droit se rattache au cloaque génital (pl. XVI, fig. 1, *ra*). Le rétracteur

pénien *(rp)* est long, vigoureux et pigmenté; il court entre l'oviducte libre et l'œsophage, et parvenu à la face dorsale du dernier tour, assez en arrière, il s'insère sur le côté gauche du diaphragme.

De nombreux exemplaires, dont la coquille était complètement développée, n'offraient pas le moindre signe de pénis. Chez un individu recueilli au bord de la petite rivière «Mølleaa» ($^2/_{10}$ 1921) existait, il est vrai, un pénis, mais extrêmement mince, beaucoup plus que le nerf allant à l'appareil génital femelle. Un autre spécimen, recueilli en même temps et dans le même endroit, possédait un pénis bien développé.

Les organes génitaux de l'espèce dont nous parlons ont été brièvement décrits par Watson[81]), p. 270—71. Ses indications s'accordent bien avec les observations faites par moi. Watson désigne la partie proximale du pénis, un peu plus étroite, sous le nom d'épiphallus, disant que des cellules glandulaires s'aperçoivent dans le pénis même, mais non pas dans l'épiphallus. De même, il base sa division de l'oviducte sur l'existence ou le défaut de cellules glandulaires (dans les différentes parties). Plusieurs des exemplaires étudiés manquaient de pénis comme les spécimens danois.

Vertigo pygmaea Drap.

Pl. XIV, fig. 3; pl. XVI, fig. 5, et pl. XVII.

Description d'après des animaux étendus, recueillis dans la fôret de «Terkelskov» en Seeland, le 5 octobre 1912.

La glande hermaphrodite (pl. XVII, *gh*) comprend deux faisceaux d'acini lourds et grossiers, qui ont une tendance à se diviser en deux. Chez un individu on comptait 6 acini dans l'un des faisceaux, 9 dans l'autre; chez deux autres exemplaires les chiffres étaient moins élevés: 5 et 6. Les acini sont blancs, enveloppés d'un voile de tissu conjonctif contenant du pigment noir, qui est particulièrement développé dans les espaces intermédiaires entre eux. Les conduits excréteurs des deux faisceaux que forme la glande hermaphrodite, se réunissent par devant en un court canal droit, puis vient une partie très courte et légèrement enroulée; ces deux sections du canal hermaphrodite sont sombres, pigmentées. A la partie faiblement enroulée se joignent quelques grands replis, de couleur

blanche *(dh)*, dont la dernière se prolonge dans un court conduit; quand celui-ci est arrivé à la glande albuminipare, il se recourbe vers le haut en angle droit pour suivre la région supérieure de la longue poche de fécondation *(pf)*, dans le sommet de laquelle il se continue insensiblement sans qu'aucune dilatation de la poche se constate à cet endroit. La glande albuminipare *(ga)* est très développée chez tous les spécimens examinés; elle est linguiforme et sa face externe est fortement courbée, tandis que l'interne est droite ou faiblement concave; les acini ne sont qu'indistinctement délimités.

Le spermoviducte est très court et simplement construit, à peu près comme chez le *V. moulinsiana*. Dans la cavité de la région supérieure de l'oviducte se trouve la base de la glande albuminipare. Dans le bas, du côté extérieur de l'oviducte, se voit une faible échancrure. La prostate *(pr)* forme une partie triangulaire, dont la pointe est tournée en dehors, vers la vésicule de la poche copulatrice; elle se compose d'un tronc d'où partent de 2 à 4 ramifications latérales, dont les dimensions diminuent vers le sommet du triangle. Le canal séminal *(cs)* apparaît du côté concave de l'oviducte comme une bande blanche, toute courte. L'oviducte libre *(ol)* est extraordinairement long. Tandis que la section femelle du spermoviducte présente des parois grises, de consistance gélatineuse, l'oviducte libre est d'un blanc jaune, non transparent, et un peu plissé sur la face extérieure. Les parois du vagin *(va)* sont très minces, à demi transparentes; les deux tiers inférieurs sont, ainsi que le cloaque génital court, rattachés à la paroi droite du corps par de fins ligaments conjonctifs. Le pédoncule de la poche copulatrice *(pd)* est assez difficile à suivre, étant extrêmement mince, surtout dans sa partie supérieure. Il ne se constate aucune dilatation, ou seulement une dilatation insignifiante, au lieu de naissance du pédoncule; ce dernier suit le côté de l'oviducte tourné vers le pénis, s'enfonce dans l'échancrure en bas du spermoviducte, longe la paroi convexe de celui-ci et se replie alors sur sa face supérieure, où il se dilate en une grande vésicule piriforme *(rs)*, dont la région supérieure touche à la glande albuminipare et arrive à peu près jusqu'à la prostate.

Le canal déférent *(vd)* est très long, de même que le pénis *(pé, $pé_1$, ép)*. Ce dernier se compose de 3 parties différentes: une

distale, en forme de tube *(pé)*, une moyenne *(pé₁)*, un peu plus courte et plus grosse, courbée en forme de croissant, et une troisième toute mince qui ne devient un peu plus renflée que vers le lieu d'accès du canal déférent *(ép)*. Le rétracteur *(rp)* se fixe au diaphragme *(dp)*, très en arrière, juste au-dessus de la pointe du pied. Le nerf allant au pénis *(np)* envoie en outre une fine ramification au canal déférent.

Un exemplaire a été fixé, le pénis et le cloaque génital renversés (pl. XIV, fig. 3; pl. XVI, fig. 5). Ce dernier *(cl)* formait un bourrelet en forme d'anneau autour de la base du pénis retourné. Du côté postérieur du bourrelet une petite ouverture indiquait l'entrée du vagin *(o.va)*. Le pénis *(pé)* avait la forme d'un tube cylindrique, recourbé au milieu en angle droit. La moitié seulement en était renversée, et il se peut qu'une partie plus grande, ou peut-être tout le pénis, se renverse pendant l'accouplement.

La courte description de Watson[81]), p. 272, s'accorde avec la mienne; il dit cependant que l'oviducte libre est court, ce qui n'est certainement pas le cas chez les exemplaires danois. Aucun des spécimens anglais examinés ne manquait de pénis, pas plus que les danois. L'examen de Moquin-Tandon[41]) (p. 406; pl. XXVIII, fig. 42) n'a pas été trop exact, la prostate et la poche copulatrice, par exemple, ont été reproduites d'une manière tout à fait incorrecte, et le rétracteur pénien fait défaut. La description et la figure de Lehmann[33]) (p. 151; pl. 14, fig. 53) sont de même extrêmement incomplètes et inexactes.

Vertigo antivertigo Drap.

Pl. XVIII, fig. 1—3 et pl. XIX, fig. 1.

D'après des individus danois, dont quelques-uns, provenant de «Fiskebæk» au bord du «Furesø» et recueillis au mois d'octobre 1920, étaient entièrement étendus ou contractés, tandis que les autres, trouvés à «Nøddebo» au bord du «Esromsø», le 1er août, étaient tous étendus.

La glande hermaphrodite *(gh)* est grande et divisée en 2 faisceaux d'une manière peu distincte; le nombre d'acini est assez variable et difficile à indiquer, les follicules glandulaires épais et piriformes ayant une tendance marquée à se diviser; c'est donc une question d'appréciation de décider jusqu'à quelle profondeur

il faut que chaque acinus soit fendu pour pouvoir le compter pour deux. Le faisceau apical comprenait de 5 à 9 acini, l'autre de 5 à 8. Chez un seul individu les échancrures s'enfonçaient si peu, qu'on pouvait dire que les faisceaux se composaient respectivement de 5 et de 3 acini. Ceux-ci sont fortement pigmentés, surtout au sommet.

Le canal hermaphrodite *(dh)* est très fortement pigmenté. On voit par les deux exemplaires figurés que l'enroulement de la partie moyenne varie un peu. Par l'étude d'un grand nombre de spécimens il a été constaté que l'aspect du canal dépend pour une bonne part du degré auquel il est rempli. Dans la fig. 1, pl. XIX, on remarque que le repli intérieur est très grand ; il est en outre blanc d'un côté. Ces deux qualités sont dues à la grande abondance de spermatozoïdes qu'il contient.

La poche de fécondation *(pf)* est blanche, placée dans une position oblique par rapport au sens longitudinal de la glande albuminipare ; elle est un peu élargie en haut (pl. XVIII, fig. 2), de manière que la limite entre la dernière partie du canal hermaphrodite, étroitement serrée contre la poche de fécondation, et l'extrémité de celle-ci peut être facilement déterminée. Vers le bas, le tube cylindrique qui constitue la poche de fécondation, se prolonge dans une région dilatée, piriforme (pl. XVIII, fig. 2, *ch*), qui à son tour se continue d'une part dans l'oviducte, d'autre part dans le canal séminal, et dans la partie distale de laquelle débouchent les follicules prostatiques *(pr)*. Ceux-ci sont situés sur la limite entre la glande albuminipare et l'oviducte, entre lesquels est souvent serré le tube supérieur. Leur nombre est très petit, variant de 2 à 4 ; le plus long se trouve du côté proximal, et ils diminuent de grandeur vers le côté distal. La glande albuminipare *(ga)* est triangulaire ou linguiforme, grise, nettement pigmentée en veines, et porte, sur sa face extérieure, de très profonds sillons *(ci)* destinés à loger le foie et l'intestin. Elle n'est pas située en prolongement direct du spermoviducte, mais forme, par sa base, un angle à peu près droit avec la section femelle du spermoviducte.

Celui-ci est très court, principalement du côté concave où se trouve le canal séminal *(cs)*. L'oviducte *(ov)* est, du côté extérieur, fortement renflé, courbé en dehors et en bas, vers la base du tour de la coquille. Le spermoviducte étant, dans

les deux figures, regardé du côté supérieur et un peu du côté columellaire, on n'en voit que la face convexe et non pas le bord extérieur libre, replié. Sa région élargie, latérale (pl. XVIII, fig. 1, ov_1) forme en bas, avec la partie intérieure, un angle aigu, comme une entaille, dans lequel passe le pédoncule de la poche copulatrice. L'oviducte libre *(ol)* est extraordinairement long, surtout chez l'exemplaire entièrement étendu (pl. XVIII, fig. 1). Dans sa partie supérieure il est, vers le dehors, fortement renflé et replié, comme la section femelle du spermoviducte, mais du côté opposé. Ce que nous voyons sur la fig. 1, pl. XVIII, est la région repliée *(ol_1)*; tout en haut seulement on voit un peu de la partie *(ol)* qui continue directement le spermoviducte; chez l'individu contracté (pl. XIX, fig. 1), la région repliée *(ol_1)* est à moitié relevée. Cette région est peut-être à considérer comme un cul-de-sac rudimentaire de l'oviducte. Sa face intérieure est d'une conformation histologique tout autre que celle de l'oviducte même (on peut voir cette différence sur une figure provenant du *V. moulinsiana,* pl. XVI, fig. 3). Une figure un peu schématique (pl. XVIII, fig. 3) montre une coupe transversale de l'oviducte libre. La section femelle du spermoviducte est grise et transparente; l'oviducte libre est de couleur blanchâtre et ses parois ont une consistance plus ferme. Chez l'animal étendu (pl. XVIII, fig. 1, *va*) le vagin est long, très étroit et transparent, chez l'animal entièrement contracté (pl. XIX, fig. 1, *va*) il est beaucoup plus court et les parois sont plus compactes.

Il faut appeler l'attention sur ce fait qu'il importe de savoir si, dans une étude, les animaux ont été examinés et dessinés en état d'extension ou non; dans les deux cas, l'aspect, et surtout les dimensions de longueur et de grosseur, sont, en effet, très différents, et naturellement, plus on se rapproche du cloaque génital, plus grande devient la différence. Quelques mesures le démontrent clairement: Chez deux individus, l'un entièrement étendu, l'autre complètement contracté, on a mesuré: 1° le spermoviducte, 2° l'oviducte libre, 3° le vagin. Les deux tableaux suivants montrent le résultat de cet examen; les chiffres sont relatifs, et non pas absolus:

	I L'individu entièrement étendu	II L'individu complètement contracté
Le spermoviducte	32	32
L'oviducte libre	56	30
Le vagin	48	10

Dans le cas II, le vagin mesure à peine un tiers de la longueur du spermoviducte, tandis que, dans le cas I, il a une fois et demie la longueur de celui-ci, mais la proportion même entre les dimensions de deux parties étendues: le vagin et l'oviducte libre, varie considérablement.

La poche copulatrice (pl. XIX, fig. 2) est, le plus souvent, située de manière que son point de naissance se trouve sur la face inférieure et que, par conséquent, on ne peut la voir (pl. XIX, fig. 1); dans d'autres cas elle se trouve logée du côté du pénis, c'est-à-dire du côté opposé à celui où on la voit chez la plupart des *Pupillidae* (pl. XVIII, fig. 1; voir aussi le *V. pygmaea*). Cette différence n'existe cependant qu'en apparence, ce qui, d'ailleurs, s'aperçoit sur la fig. 1, pl. XVIII. Par suite du renflement que porte d'un côté l'oviducte libre, celui-ci a une tendance marquée à se tordre dans sa partie inférieure en faisant un demi tour sur lui-même, et le lieu d'accès de la poche copulatrice se tourne donc avec lui. Le côté de l'oviducte libre où les parois forment une arête vive qui, dans la figure, se voit comme une raie blanche sur le côté droit de cet organe, s'étend en effet chez l'individu non encore préparé, le long de la columelle, mais par suite de l'extension des organes cette partie a été tournée.

Le pédoncule de la poche copulatrice *(pd*, pd_1*)* est très mince; il court le long de l'oviducte libre, traverse l'entaille de la partie inférieure du spermoviducte, mentionnée plus haut, et continue jusqu'à la vésicule allongée *(rs)*, qui touche presque à la glande albuminipare; la vésicule est assez fortement pigmentée.

Le pénis *(pé)* n'est, sans doute, pas tout à fait développé chez l'exemplaire étendu (pl. XVIII, fig. 1); il est très simplement construit, seulement un peu plus gros dans sa moitié distale. Chez l'animal contracté (pl. XIX, fig. 1), où le pénis est complètement développé, celui-ci comprend trois parties: une proximale, tout étroite *(ép)*, une seconde assez large, au milieu, et une distale, un peu plus étroite *(pé)*. Le rétracteur pénien *(rp)* va de l'extrémité proximale du pénis *(ép)* au diaphragme *(dp)*, où il se fixe très en arrière dans le dernier tour de la coquille. Chez l'individu contracté, le rétracteur pénien l'est aussi fortement et, par conséquent, il est court. Le canal déférent *(vd)* est très long et très mince. Le nerf pénien *(np)* est analogue à celui des autres espèces du genre *Vertigo,* décrites plus haut.

Les animaux examinés possédaient tous un pénis.

La description de Watson[81]), p. 271—72, s'accorde avec celle que j'ai donnée ci-dessus. Lehmann[33]), p. 150, pl. 14, fig. 52, décrit et figure une longue prostate et un long flagellum pénien qui n'existent pas du tout; en outre, le pédoncule de la poche copulatrice est, comme pour les espèces précédentes, rendu trop court dans le dessin. En somme, il n'existe pas la moindre ressemblance entre la figure de Lehmann et la nature.

Vertigo substriata Jeffr.

Pl. XX, fig. 1 et XVI, fig. 4.

Exemplaires recueillis aux bords du «Gurresø», île de Seeland, par l'auteur, le 26 septembre 1912, et à «Tinnahinch», Co. Carlow, Irlande, par R. A. Phillips, le 6 novembre 1921. Les animaux étaient dans un état de contraction complète.

La glande hermaphrodite *(gh)* ne contient qu'un petit nombre de courts et gros acini, piriformes, et ayant une tendance à se fendre en deux. Chez l'exemplaire reproduit, ils étaient réunis en deux faisceaux bien distincts; l'apical contenait deux acini, partagés chacun en deux, et un troisième, simple; l'autre, deux acini simples et deux ayant une légère tendance à se diviser. Un autre individu présentait, dans le faisceau apical, 4 acini (dont un divisé en deux), et dans l'autre, 5 (dont un également divisé en deux). La glande est blanchâtre, enveloppée de tissu conjonctif avec de fins granules de pigment épars. Le canal hermaphrodite *(dh)* est gris, faiblement pigmenté; la partie proximale est droite, la distale enroulée en spirales lâches et assez grandes, dont la dernière est extrêmement grosse; l'extrémité monte le long de la poche de fécondation *(pf)*. Celle-ci est placée obliquement par rapport à l'axe longitudinal de la glande albuminipare; elle est faiblement dilatée dans l'extrémité supérieure où elle se continue insensiblement dans le canal hermaphrodite, et fortement dilatée en bas.

La glande albuminipare *(ga)* est blanche, légèrement brillante, avec de petits acini; sur la face extérieure se voit un sillon profond, destiné à recevoir l'intestin, et qui touche au bord supérieur

de la glande, de manière que celui-ci se présente comme creusé en long.

La section femelle du spermoviducte *(ov)* est courte, étroite et complètement lisse et unie; en bas elle n'est qu'indistinctement séparée de l'oviducte libre *(ol)*. Le renflement de l'oviducte, en forme d'aile, qui se voyait chez les trois espèces précédentes du *Vertigo*, existe, il est vrai, mais il n'est pas très grand et pas si nettement accusé; aussi, la petite entaille en bas, du côté extérieur, mentionnée pour les autres espèces, fait-elle défaut. La prostate *(pr)* se compose de 4 follicules, 3 grands et un petit, inférieur; les 3 supérieurs touchent presque à la vésicule de la poche copulatrice, le premier est serré entre la glande albuminipare et l'oviducte, et les tubes prostatiques étant de couleur blanchâtre, ils ne se distinguent que difficilement de celle-ci. Chez un autre individu la prostate comprenait de même 4 tubes glandulaires, mais ceux-ci étaient considérablement plus étroits que chez l'exemplaire reproduit. Le canal séminal *(cs)* est très court.

L'oviducte libre *(ol)* est d'une longueur égale à celle de la section femelle du spermoviducte. Il est un peu renflé d'un côté (du côté extérieur), mais il n'est pas aussi grand que chez plusieurs autres espèces du *Vertigo,* et n'a pas la courbure qui s'y constate également; il se continue insensiblement dans le spermoviducte; la découpure qui, dans la figure, se trouve entre ces deux parties, a été formée pendant la préparation par l'étirement des organes génitaux de l'animal fortement contracté. Le vagin *(va)* est court (chez l'animal contracté). Le pédoncule de la poche copulatrice *(pd)* commence nettement, chez cette espèce, par une partie un peu épassie, du côté du pénis, se replie alors sur le dessous, apparaît de nouveau sur la face supérieure, et court ensuite sur la section femelle du spermoviducte, parallèlement au bord extérieur, convexe. Ce pédoncule, extrêmement fin, se continue dans une vésicule en forme de massue allongée, dont l'extrémité supérieure touche à la glande albuminipare et souvent même s'y enfonce un peu. Un nerf venant du ganglion viscéral accompagne le pédoncule; il se prolonge le long de la vésicule jusqu'à la glande albuminipare.

L'individu recueilli à «Gurresø» possédait un pénis bien développé, se composant des trois parties ordinaires: La partie extéri-

eure cylindrique est à demi transparente; la moyenne est un peu plus grosse, et courbée en croissant *(pé)*. Environ sur la limite entre ces deux parties s'observe, sur le pénis, une dépression causée par l'ommatophore qui passe à cet endroit. La partie pénienne proximale *(ép)* est bien accusée par rapport à la moyenne, le pénis étant à cet endroit extrêmement étroit; il s'élargit peu à peu vers le lieu d'accès du canal déférent; à une petite distance de là s'insère le rétracteur pénien *(rp)*, qui est court et large. A l'attache sur le diaphragme *(dp)*, le muscle est allongé en deux pointes dans la direction d'avant en arrière. Chez un spécimen provenant de «Innehed», en Irlande, il ne s'apercevait aucune limite entre les parties extérieures, mentionnées plus haut, elles se continuaient insensiblement l'une dans l'autre (pl. XVI, fig. 4, *pé*).

Le nerf pénien *(np)* envoie d'abord une branche fine à l'endroit du pénis où l'ommatophore passe par-dessus celui-ci, puis une autre plus vigoureuse à l'endroit ordinaire du pénis, juste sur la limite du cloaque génital; il projette enfin une ramification latérale toute fine au canal déférent *(vd)*. Ce dernier est mince, et, dans tout son parcours, il suit librement le vagin et l'oviducte libre, mais il est plus serré contre les conduits excréteurs femelles que ne le montre la figure.

Plusieurs des exemplaires observés, tant du Danemark (recueillis aux mois d'octobre-novembre) que de l'Angleterre (Innehed Co., Carlow, le 6 nov. 1921) manquaient complètement de pénis. Chez un individu de «Terkelskov», trouvé au mois d'octobre 1920, le canal déférent se terminait en cul-de-sac, un peu arrondi à l'extrémité, à la hauteur où commence habituellement le pénis, mais de cet endroit partait une bandelette extrêmement mince, brillante, et d'une largeur beaucoup moindre que celle du canal déférent, se fixant au vagin là où devrait aboutir le pénis. Les ramifications antérieures du rétracteur pédieux *(ra)* arrivent jusqu'à la base du cloaque génital.

Le seul ouvrage de la littérature malacologique, où se trouve exposée l'anatomie de cette espèce, est celui de Watson[81]), p. 272; tous les spécimens étudiés par lui manquaient de pénis.

Vertigo pusilla Müll.

Pl. XXI, fig. 1 et 2; pl. XXVI, fig. 2.

L'exemplaire figuré a été dessiné d'après un animal contracté, recueilli à «Terkelskov», en Seeland, le 20 octobre 1920. La coquille est sénestre, et les entrailles le sont donc aussi.

La glande hermaphrodite *(gh)* se compose de 2 faisceaux bien distincts, l'apical contenant 4 à 5 acini, l'autre, 4—6, dont 1 ou 2 sont divisés en deux; tous les acini sont finement pigmentés. Le canal hermaphrodite *(dh)* est fortement tortueux, mais les replis ne sont pas très grands; il est largement pigmenté. Les parties distale et proximale, droites, sont courtes. La poche de fécondation *(pf)* est blanche, et placée assez obliquement. La glande albuminipare *(ga)* est triangulaire, d'un blanc jaunâtre, et il est difficile d'en délimiter les acini. Sa position est à peu près perpendiculaire sur le spermoviducte, ce qui s'aperçoit surtout nettement quand on les regarde tous deux du côté extérieur (pl. XXVI, fig. 2).

La prostate *(pr)* n'est constituée que par deux acini, longs et d'un jaune vif, qui sont presque entièrement enchassés dans le sillon entre la glande albuminipare et l'oviducte; ayant la même couleur que la première, ils ne s'en distinguent que difficilement. Le spermoviducte est court, comme à l'ordinaire, coupé en biais dans le haut; la section femelle *(ov)* est fortement courbée d'un côté à l'autre (mais la rainure de la face inférieure n'est pas aussi accusée que chez le *Vertigo moulinsiana*); les parois étant à demi transparentes, le revêtement épithélial intérieur, blanc, s'aperçoit du dehors.

L'oviducte libre *(ol)* paraît blanchâtre par opposition au spermoviducte; les parois en sont à demi transparentes. Il a la forme d'un tube avec de légers renflements latéraux; ceux-ci étaient plus faibles encore chez un autre individu qui n'était pas aussi retiré dans la coquille; la grande partie recourbée, en forme de sac, que nous connaissons par le *Vertigo antivertigo*, n'existe pas ici. Le vagin *(va)* est court et recourbé en angle, ce qui est dû certainement à l'état complètement contracté de l'animal.

La poche copulatrice *(rs)* présente un pédoncule qui, à son lieu de naissance, est un peu plus épais *(pd)*, mais qui, vers le haut, devient extrêmement mince. Dans la figure il commence du côté

du pénis, mais la région inférieure de l'oviducte libre et le vagin sont tordus, décrivant un tour de 90 à 180 degrés; aussi, le pédoncule se plie-t-il sous l'oviducte libre et se continue-t-il le long du côté concave de celui-ci. Sur le spermoviducte il se replie sur la face supérieure et longe parallèlement le bord convexe. Chez un des exemplaires (pl. XXI, fig. 1 et 2), la vésicule est allongée en forme de massue et touche à la glande albuminipare, chez l'autre (pl. XXVI, fig. 2) elle est plus courte, plus gonflée et saillit librement sur l'angle supérieur, libre, du spermoviducte.

Le pénis ressemble beaucoup à celui de l'espèce précédente, la différence est surtout peu sensible entre l'individu disséqué provenant d'Irlande (pl. XVI, fig. 4) et celui de l'espèce dont nous nous occupons. Dans les deux cas il ne se distingue que deux parties: une proximale *(ép)*, où débouche le canal déférent, et qui atteint sa plus grande largeur au lieu d'accès de ce canal et à l'attache du rétracteur, tandis que, du côté distal, elle se rétrécit de plus en plus, et une autre partie distale *(pé)*, qui, contrairement à la précédente, est étroite au début et s'élargit ensuite rapidement; la plus grande partie de cette dernière, qui a deux fois la longueur de la précédente, est constituée par un tube cylindrique qui, à un endroit seulement, présente une dépression, probablement l'empreinte de l'ommatophore. Chez un autre spécimen la partie proximale était plus longue, équivalente aux deux tiers environ de la distale.

Le rétracteur pénien *(rp)* se rattache, de la manière ordinaire, au diaphragme *(dp)*; l'espèce étant sénestre, le nerf pénien *(np)* prend naissance au ganglion cérébroïde gauche, mais se fixe, sur le pénis et le canal déférent, à l'endroit ordinaire, près du cloaque génital. Le canal déférent *(vd)* est long, il suit le côté concave du vagin et de l'oviducte libre, et dans la plus grande partie de ce parcours, il y est faiblement relié à l'aide d'un tissu conjonctif. Le cloaque génital *(cl)* est très court; à sa base s'insère la partie antérieure du rétracteur pédieux.

Quelques-uns seulement des exemplaires possédaient un pénis développé, bien que les individus examinés aient été recueillis, soit en différentes saisons (aux mois de mai, août, septembre et octobre), soit dans différentes localités. Deux spécimens seulement, sur 15 observés, présentaient un pénis bien développé, et ces ex-

emplaires avaient été recueillis en même temps que d'autres qui, à en juger par la coquille, avaient le même âge, mais chez lesquels le pénis faisait défaut.

Watson[81]), p. 273—74, a examiné des spécimens anglais, dont 10 avaient été trouvés au mois de juin, 7 au mois d'octobre, et chez aucun d'eux le pénis ne s'était développé. Lehmann[33]) n'a aucune description de cette espèce, mais il donne une figure (pl. 14, fig. 54) qui, selon l'éditeur, en représente peut-être un exemplaire, mais qui n'a pas la moindre ressemblance avec les miennes.

Vertigo angustior Jeffr.

Pl. XXII, fig. 1—3.

La figure est dessinée d'après des exemplaires entièrement étendus, recueillis par l'auteur à «Terkelskov», en Seeland, le 15 octobre 1917. De nombreux spécimens provenant de la même localité ont été examinés.

La glande hermaphrodite *(gh)* est constituée par deux faisceaux d'acini nettement séparés, qui, vus du dehors, se distinguent comme deux taches du foie supérieur, faiblement pigmentées. Les acini sont très grands, de forme globulaire, mais un peu anguleux et bordés de pigment noir. Le canal hermaphrodite *(dh)* est blanchâtre; le pigment se trouve principalement logé dans le tissu conjonctif entourant les replis et remplissant les espaces intermédiaires. Les replis sont peu nombreux et presque partout du même calibre. La glande albuminipare *(ga)* est grande et blanchâtre, en forme de triangle, et avec de grands acini bien distincts. La poche de fécondation *(pf)* est assez courte, volumineuse et grossière; la dernière partie du canal hermaphrodite ne débouche pas dans son extrémité, mais sur son côté. Dans le bas, cette poche se continue dans une grande chambre allongée. Sur la limite entre celle-ci et le canal séminal *(cs)*, qui en forme la prolongation le long du côté droit ou légèrement concave du spermoviducte, aboutissent trois tubes prostatiques *(pr)* bien séparés; le supérieur, qui est aussi le plus grand, est à peu près caché entre l'oviducte et la glande albuminipare. Chez un autre individu, il n'a été constaté que deux tubes glandulaires, presque entièrement dissimulés. Le spermoviducte est court et grisâtre, considérablement plus courbé que chez le *V. pu-*

silla; l'oviducte libre *(ol)* est blanc, étroit, et seulement peu renflé par suite de l'état fortement étendu de l'animal; il a l'apparence d'un simple sac. Le vagin *(va)* n'a que la moitié de la longueur de l'oviducte libre.

La poche copulatrice *(rs)* est très longue. Le pédoncule, peu épaissi à sa base, saillit sur la face inférieure, un peu plus du côté columellaire que du côté du pénis. Ayant tout son parcours sur la face inférieure des conduits génitaux femelles, il longe d'abord l'oviducte libre, pour traverser enfin, obliquement, la partie inférieure du spermoviducte. La vésicule est d'un gris clair, très grande, ovale ou piriforme (pl. XXII, fig. 3); elle est placée sur le côté extérieur et supérieur de l'oviducte, tout près de la glande albuminipare. Chez un individu qui ne possédait pas de pénis, la vésicule était très grande et complètement globulaire (pl. XXII, fig. 2).

Le pénis *(pé + ép)* a la même structure que celui de l'espèce précédente. Le rétracteur pénien *(rp)* est extraordinairement long et mince (l'animal étant fortement étendu); il se fixe très en arrière sur le diaphragme *(dp)*, au côté inférieur du dernier tour de l'animal, à peu près au-dessus de l'extrémité caudale. L'innervation du pénis n'offre rien de particulier *(np)*.

Le canal déférent *(vd)*, très long, se rattache au vagin et à l'oviducte libre, à l'aide d'un tissu conjonctif lâche. Le cloaque génital *(cl)* est bien développé, et c'est à lui que se fixe la partie antérieure du rétracteur pédieux *(ra)*. Pour cette espèce aussi, il est relativement rare de rencontrer des exemplaires à pénis bien développé. Sur 27 individus, recueillis à «Terkelskov» le 15 octobre 1917, 3 seulement en possédaient un.

L'espèce n'a pas été décrite par Watson; celui-ci pense cependant[81]), p. 274, que la fig. 54 *G* de Lehmann[33]) représente probablement le *V. angustior*. Cela est bien vraisemblable, puisqu'il ne se trouve dans le texte aucune mention des organes génitaux du *V. pusilla*, mais, par contre, une description de ceux du *V. angustior* (p. 155—156); cependant, quelle que soit l'espèce qu'elle représente, la figure ne ressemble dans aucun cas aux miennes.

Nesopupa moreleti Brown.

Fig. 19 du texte.

Pour l'étude du genre *Nesopupa* je n'ai pu me procurer qu'un seul exemplaire appartenant à l'espèce *N. moreleti.* L'individu a été découvert dans l'ouverture d'une coquille terrestre plus grande,

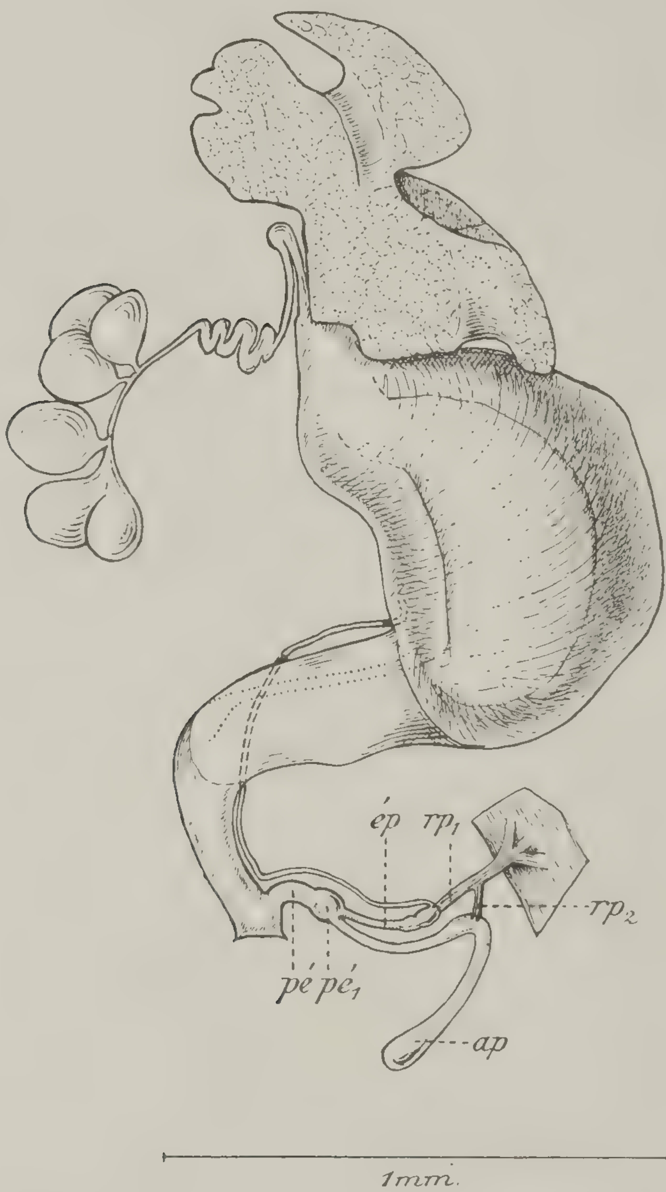


Fig. 19. Organes génitaux de *Nesopupa moreleti* Brown. — *ap*, appendice; *ép*, épiphallus; *pé*, *pé*1, parties péniennes; *rp*1, *rp*2, les deux branches du rétracteur pénien.

recueillie dans les îles de Banda par le Dr Th. Mortensen. L'animal était contracté et pas bien conservé; à la dissection, je n'ai réussi, par conséquent, à distinguer que les traits essentiels de la structure des organes génitaux; la poche copulatrice et la prostate — si cette dernière existe chez l'espèce en question — n'ont pas pu être reproduites dans la figure.

La glande hermaphrodite se compose de 6 acini jaunes, très grands et à peu près globulaires; ils débouchent directement dans

un conduit excréteur commun, qui se continue dans le canal hermaphrodite; celui-ci présente, dans son milieu, 4 replis en zigzags, puis une partie droite, aboutissant dans la région supérieure, élargie, de la poche de fécondation. La glande albuminipare est grande, avec de profonds sillons destinés à l'intestin, et avec des acini bien distincts. Le spermoviducte a la même forme simple, semblable à un sac, que chez le genre *Vertigo*. Ses parois sont épaisses et d'un aspect grisâtre, gélatineux; il contraste par là avec l'oviducte libre, plus clair, dont les parois ont une consistance plus ferme. Ce dernier se continue insensiblement dans le vagin cylindrique. A la partie supérieure de celui-ci, du côté columellaire, prend naissance le pédoncule de la poche copulatrice, dont la base est un peu épaissie. Aucun muscle ne se rattache au cloaque génital court. Le pénis comprend trois parties: une extérieure, cylindrique *(pé)*, qui se continue dans celle du milieu, globulaire *(pé$_1$)*; dans cette dernière s'ouvre enfin la 3^e partie, proximale, étroite *(ép)*, ainsi qu'un appendice très long, qui dans sa région distale est dilaté en forme de massue *(appendix, ap)*. Au lieu d'accès précis du canal déférent, la partie pénienne proximale *(ép)* est un peu gonflée, et à cet endroit s'insère la branche principale du rétracteur pénien *(rp$_1$)*. Une ramification latérale, plus petite *(rp$_2$)*, se fixe à l'appendice du pénis. Le rétracteur pénien est court et se rattache au diaphragme par une base très large, à trois branches. Le canal déférent est mince; il suit le parcours ordinaire et débouche dans la région inférieure du spermoviducte.

Truncatellina rivierana Benson.

Pl. XXIII, fig. 1—3.

Les examens ont été faits sur des exemplaires incomplètement étendus, recueillis par le D^r Mermod, Genève, le 10 octobre 1920.

Vue du dehors la glande hermaphrodite *(gh)* apparaît comme deux taches noires, à une certaine distance l'une de l'autre. Chacune de ces taches correspond à un faisceau d'acini, dont l'apical compte 9 acini, l'autre 11. Ceux-ci sont de taille et d'aspect très variables, globulaires ou piriformes. Les pédoncules sur lesquels sont placés les deux faisceaux sont extrêmement longs. Les acini

mêmes sont blancs, mais enveloppés d'une couche conjonctive, épaisse et pigmentée, et de plus couverts en dehors par l'épithélium du sac viscéral avec son tissu conjonctif sous-jacent, lequel est coloré en noir en face des faisceaux de la glande hermaphrodite.

Le canal hermaphrodite *(dh)* est long, à son début blanc et droit, pigmenté dans la partie tortueuse du milieu; chez les trois spécimens examinés, il se constatait une différence assez accentuée dans le degré d'enroulement; chez l'exemplaire dessiné, le canal n'était que légèrement replié sur lui-même, tandis que chez un autre, il présentait de grands replis fortement renflés; un 3e individu représentait une forme moyenne.

La glande albuminipare *(ga)* était de même sujette à de grandes variations quant aux dimensions et au développement. Dans tous les cas, la grande anse intestinale, en forme d'S, s'enfonce profondément dans la glande, sans être pourtant entièrement enveloppée par la masse glandulaire. La dernière partie du canal hermaphrodite passe insensiblement dans la poche de fécondation (fig. 2, *pf*), en formant avec elle un angle, ayant la pointe tournée en haut. Vers le bas, cette poche est fortement élargie. Il n'existe pas de prostate visible du dehors.

Le spermoviducte est assez court, surtout la région tournée vers la columelle où se trouve le canal séminal *(cs)*. La section femelle a la forme d'un tube, il est vrai, mais ce tube est, du côté extérieur, fortement dilaté, à tel point que la paroi doit former, à cet endroit, des plis profonds *(a—f)*. La première partie en est étroite, placée radiairement par rapport à la columelle et perpendiculairement par rapport à la direction longitudinale de l'oviducte; elle est blanche et d'une consistance plus ferme que le reste de ce conduit, qui est grisâtre et gélatineux. Cette partie n'est pas visible en dessus, mais sa continuation immédiate *(a)* apparaît sur la face supérieure. La partie suivante forme un grand pli semblable à un V couché. L'échancrure qui sépare les deux côtés de ce pli *(b* et *c)* s'enfonce profondément dans l'oviducte et se remarque sur la face supérieure de celui-ci (i_1). Ensuite vient un grand pli, très large, qui se dirige en haut, tourné vers l'observateur *(c, d, e)*, et enfin un autre, plus petit,

en forme de $\angle$ *(ef)*, dont la partie arquée en dedans dessine, dans la figure, une petite entaille *(i_2)*.

L'oviducte libre *(ol)* est long et cylindrique, un peu plus large seulement en haut, où il se joint au spermoviducte. La poche copulatrice diffère de celle des autres genres de la même famille en ce que le pédoncule *(pd)* est très court. La vésicule piriforme *(rs)* se trouve, par conséquent, située le long de la région supérieure de l'oviducte libre, juste au-dessous du dernier renflement de la partie extérieure du spermoviducte. Le pédoncule suit le revers de l'oviducte, et débouche, un peu élargi seulement, du côté du pénis. Chez l'exemplaire reproduit par la figure principale (fig. 1), ce dernier *(pé)* est fortement développé, étiré et légèrement sinueux; le tiers distal constitue un tube droit, uniformément cylindrique, puis s'observe une partie élargie, sinueuse, s'atténuant peu à peu vers le canal déférent. Un autre exemplaire (fig. 3) présente un épaississement considérable de la partie moyenne du pénis.

Le rétracteur pénien *(rp)* se fixe juste sur la limite des deux parties du conduit excréteur mâle: le canal déférent et le pénis; chez l'animal presque entièrement contracté, il s'avance de là, du côté gauche, et s'insère sur le diaphragme, dans la ligne médiane, non loin de l'endroit où celui-ci se joint au bord du collier palléal. Le nerf pénien *(np)* est inclus dans du tissu conjonctif avec les vaisseaux allant au pénis; il se divise en plusieurs ramifications, dont deux vont à ce dernier, une au canal déférent. Ce canal *(vd)* longe, en décrivant les $^3/_4$ d'un tour, le vagin dans toute sa longueur, ainsi que la région inférieure de l'oviducte libre; puis il s'enfonce dans la paroi de ce dernier, où il s'aperçoit comme une raie blanche *(vd_1)* dans tout le reste de son parcours jusqu'au canal séminal. Ceci est un cas très particulier.

Le cloaque génital *(cl)* est bien développé; le rétracteur pédieux envoie à sa moitié inférieure quelques fibres musculaires *(ra)*. L'un des trois exemplaires étudiés ne possédait pas de pénis.

La forme principale même n'a pas été examinée antérieurement, le *T. britannica* Pilsbry, au contraire, qui, à présent, est regardé généralement comme une sous-espèce du *T. rivierana* Bens., a été décrit par Watson[81]), p. 274, et cette description s'accorde assez exacte-

ment avec la mienne. Il parle de trois parties de l'oviducte, histologiquement dissemblables.

Truncatellina costulata Nilss.

Pl. XXIV, fig. 1 et 2.

Deux exemplaires danois, recueillis par l'auteur dans l'île de «Møen», en juillet 1922, ont été étudiés; l'un des individus était fortement contracté, l'autre un peu plus étendu.

La glande hermaphrodite *(gh)* ressemble beaucoup à celle de l'espèce précédente; elle se compose de deux faisceaux d'acini, assez éloignés l'un de l'autre; les acini sont blancs, à peu près globulaires, bordés de pigment tout noir, et couverts, du côté de la paroi du corps, par une accumulation dense de pigment, disposé en spirales. Le faisceau apical comprend 4—6 acini, l'autre, 5—7. Les longs conduits excréteurs des deux faisceaux, ainsi que la partie droite du conduit principal *(dh)*, sont blancs; la partie grossièrement enroulée du canal hermaphrodite est, au contraire, pigmentée. La poche de fécondation *(pf)* est de la même grosseur que la dernière partie du canal hermaphrodite, de laquelle elle ne se distingue pas bien. Elles constituent ensemble une simple figure en forme de V. Dans le bas, la poche se dilate considérablement. Il n'existe pas de prostate visible extérieurement.

La glande albuminipare *(ga)* est extraordinairement longue, étroite et linguiforme; par conséquent, elle est facilement disjointe en plusieurs fragments par la grande anse intestinale en forme d'S, qui l'entoure. La partie extérieure et inférieure de l'anse est enchâssée dans le sillon entre la glande albuminipare et l'oviducte. De là elle monte en décrivant une grande courbe, semblable à un U renversé incomplet, jusqu'au milieu de la face extérieure de la glande, d'où l'anse se dirige de nouveau en bas et en dedans, perpendiculairement sur la columelle; arrivée au côté intérieur (fig. 1), il se courbe vers le haut et sa place est indiquée ici par un sillon transversal tracé sur la face glandulaire intérieure *(ci_1)*. Ce sillon étant si profond qu'il coupe presque la glande, celle-ci se déchire facilement à cet endroit. L'intestin en suit enfin le bord supérieur *(ci_2)*.

La section femelle du spermoviducte présente des parois gélatineuses, fortement repliées en un zigzag, dont les angles sont alter-

nativement saillants et rentrants. On distingue, sur la face supérieure, 5 plis *(a—e)*, dont les deux derniers *(d, e)* sont petits. Les lumières des plis transversaux sont toutes en communication l'une avec l'autre et en outre avec la grande lumière commune de l'oviducte, s'étendant le long du canal séminal.

L'oviducte libre *(ol)* est très long, et par sa couleur blanche il se distingue nettement de l'oviducte grisâtre. La poche copulatrice est relativement courte, surtout la région pédonculaire *(pd)*, qui n'est pas beaucoup plus longue que la vésicule *(rs)*. Le pédoncule saillit sur la face inférieure de la partie proximale du vagin, du côté tourné vers le pénis. La vésicule a la forme d'une massue, extrêmement longue et large; elle est remplie d'un liquide, et dans son milieu se trouve une masse solide, jaunâtre, probablement le reste d'un spermatophore.

Le pénis *(pé)* fait défaut chez l'un des trois individus examinés, chez le second il existe, mais faiblement développé (fig. 2), tandis que le troisième seul en possède un bien développé (fig. 1). La partie distale est étroite, cylindrique, la région située auprès du canal déférent, piriforme, et courbée dans la partie étroite, à l'extrémité de laquelle se fixe le rétracteur *(rp)*. Celui-ci est long et mince, et se rattache au diaphragme *(dp)*, bien en avant, dans la ligne médiane, ou plutôt un peu à droite de cette ligne.

Le canal déférent libre *(vd)* est court; il suit le vagin et monte un peu le long de l'oviducte libre pour s'enfoncer enfin dans celui-ci; le reste de son parcours jusqu'au canal séminal est marqué par une raie fine *(vd_1)*.

Le nerf pénien *(np)* est extrêmement fin et difficile à apercevoir; il se fixe au pénis, à une certaine distance du cloaque génital, et envoie une branche latérale au canal déférent; peut-être projette-t-il encore une ramification à la partie extérieure du pénis, sur la limite du cloaque génital, ce qui était cependant très difficile à constater avec certitude. Le cloaque génital *(cl)* est bien développé; quelques filaments partant de la région antérieure du rétracteur pédieux s'y insèrent, comme à l'ordinaire *(ra)*.

La figure et la description de Lehmann[33]), p. 147—148, pl. 14, fig. 51, sont très inexactes; il parle surtout d'un long flagellum situé sur la partie proximale du pénis, lequel n'existe pas du tout.

Truncatellina cylindrica Fér.

Pl. XXV, fig. 1; pl. XXVI, fig. 1.

Les individus examinés étaient en partie des spécimens à demi étendus, trouvés par l'auteur au port de «Klintholm», dans l'île de «Møen», le 8 juillet 1922, en partie des exemplaires contractés, recueillis par B. Klett, en Thuringe, le 5 octobre 1920.

La glande hermaphrodite *(gh)* est du même type que chez les deux autres espèces. Dans les faisceaux apical et inférieur se trouvaient, chez les exemplaires allemands, respectivement 9 et 7 acini, chez les individus danois, des nombres moins élevés: 6—7 et 5—6. Les acini sont blanchâtres, un peu irrégulièrement piriformes, en partie conjoints, et couverts en dehors par un tissu conjonctif noir, fortement pigmenté. Le canal hermaphrodite *(dh)* comprend une longue partie proximale, droite, qui est blanche, et une autre tortueuse, légèrement pigmentée.

La glande albuminipare *(ga)* est très grande, environ une fois et demie la longueur du spermoviducte; chez les exemplaires allemands, elle est à demi transparente et jaunâtre, chez les danois, d'un blanc pur. L'anse intestinale (pl. XXVI, fig. 1, *in*) s'enfonce entièrement dans la glande, de sorte que, sur une certaine étendue, elle est complètement enveloppée de celle-ci; à part cela, son parcours est comme chez l'espèce précédente (pl. XXV, fig. 1, *ci*).

La poche de fécondation (pl. XXVI, fig. 1, *pf*) se présente, chez le spécimen allemand figuré, comme un bâton courbé, d'une extrême blancheur, dans lequel débouche la dernière partie du canal hermaphrodite, en formant avec lui un angle droit. La poche est entièrement enchâssée dans la masse glandulaire. Depuis son extrémité elle s'enfonce obliquement dans la glande albuminipare, vers la base de celle-ci, pour apparaître ensuite sur le côté extérieur, où elle se termine par une région inférieure, blanche et dilatée. Chez l'exemplaire danois figuré (pl. XXV, fig. 1), le canal hermaphrodite ne va pas directement à l'extrémité de cette poche, mais il n'y passe insensiblement, en décrivant une courbe, qu'après s'être dirigé vers un point situé un peu en-dessous.

La poche de fécondation s'élargit comme une ampoule vers le bas, où elle communique avec la chambre de l'albumine, formant une partie blanche plus ferme *(ch)*. Sur les côtés extérieur et in-

férieur (pl. XXVI, fig. 1) ne se voient, outre cette chambre, que 4 lacets *(1—4)*. Sur les faces intérieure et supérieure (pl. XXV, fig. 1) ils ne sont pas aussi prononcés *(ov)*. Le long pli semblable à une incision se trouve entre les lacets *2* et *3*. Il n'existe pas de prostate extérieure. Le spermoviducte est très court; l'oviducte libre *(ol*, ol_1*)* est, en revanche, extraordinairement long; il est droit, de couleur blanche et un peu aplati. Le vagin *(va)* est cylindrique, et mesure à peine la moitié de la longueur de l'oviducte libre. La poche copulatrice prend naissance sur la face inférieure, un peu plus du côté du pénis que du côté columellaire. Le pédoncule *(pd)* est relativement court et un peu élargi à sa base; la vésicule *(rs)*, qui a la forme d'une massue ou d'un cylindre, est assez grosse, mais pas aussi accentuée que chez l'espèce précédente; elle est plus rapprochée du côté extérieur du tour. Une bande musculaire ou conjonctive va de l'extrémité de la vésicule à la partie inférieure et extérieure du spermoviducte *(z)*.

Le cloaque génital *(cl)* est court et gros. Le pénis (pl. XXV, fig. 1, *pé*) est constitué par un tube cylindrique, replié en forme de crochet dans sa région proximale. La partie droite est plus volumineuse au milieu, et forme quelques sinuosités irrégulières du côté tourné vers le vagin. Le rétracteur pénien *(rp)* se rattache à la région courbée en crochet; il est long, et chez l'animal à demi contracté il s'insère au diaphragme *(dp)*, très en avant, sur un point si rapproché du côté droit que le rétracteur est serré contre la paroi du corps, et y est souvent collé, de sorte qu'à un examen moins minutieux, il a l'air d'être fixé à cette paroi.

Le canal déférent *(vd)* est rattaché à la paroi du corps à l'aide de filaments conjonctifs, et quelques cordes conjonctives bien vigoureuses (renfermant peut-être des fibres musculaires) le relient aussi au pénis. Dans une de celles-ci court le nerf pénien *(np)*, qui envoie aussi une ramification au canal déférent, très court. Chez l'exemplaire danois, tout à fait développé, ce canal s'enfonce dans le conduit excréteur femelle, à un endroit situé encore plus du côté distal que chez les autres espèces, c'est-à-dire au-dessous ou, en tout cas, à la hauteur du lieu de naissance du pédoncule de la poche copulatrice, par conséquent, dans l'extrémité supérieure du vagin. Son prolongement se distingue comme une raie claire parcourant tout l'oviducte libre.

Chez le spécimen allemand (pl. XXVI, fig. 1), où le pénis fait défaut, seule une toute petite partie du canal déférent est libre, située presque entièrement sur la face supérieure du vagin. De là on peut le suivre, se dirigeant obliquement en travers de l'oviducte libre, jusque sur le côté columellaire (de x à y), et dans tout ce parcours, il ne peut en être détaché. Arrivé au bord (à y), il semble déboucher dans une rainure se continuant dans le canal séminal du spermoviducte. Peut-être faut-il considérer le spermoviducte comme s'étendant jusque là (donc, ol_1 y compris), bien que cette manière d'apprécier soit opposée à d'autres circonstances de structure, surtout à l'aspect uniforme de toute la partie appelée oviducte libre.

L'examen des organes génitaux de cette espèce, fait par Lehmann[33]), p. 140, pl. 13, fig. 47, est aussi défectueux et aussi inexact que pour l'espèce précédente. Ici, il a également dessiné un flagellum pénien, seulement il l'a placé dans un autre endroit.

Columella edentula Drap.

Pl. XXVII, fig. 1—4; pl. XXVIII, fig. 3; fig. 20 du texte.

Les animaux examinés ont été recueillis par l'auteur en Danemark (à «Ganløse Ore», le 11 novembre 1921, à «Gurre», le 26 novembre 1912), et en Suède, (à «Skäralid», le 4 août 1922); les spécimens étaient entièrement étendus.

La glande hermaphrodite (pl. XXVII, fig. 1, *gh*) comprend deux faisceaux assez éloignés l'un de l'autre et formés d'acini à peu près globulaires; elle ressemble beaucoup à deux grappes de raisins. Chaque faisceau se compose de 12—13 acini. La couleur en est d'un jaune clair et la glande même ne renferme pas de pigment; la paroi du corps, au contraire, est fortement pigmentée en noir à la hauteur de l'endroit où se trouvent les deux faisceaux. Le tiers proximal du canal hermaphrodite est droit, la partie moyenne, régulièrement repliée en zigzag et faiblement pigmentée, et le tiers distal, courbé en forme d'U. Chez les individus danois examinés, la poche de fécondation est à peu près droite, à l'extrémité un peu élargie et repliée. La dernière partie du canal hermaphrodite qui y conduit, ne se dirige que vers le milieu de la poche, ou même vers un point plus rapproché de l'extrémité faiblement élargie, de sorte qu'elle ne la longe que sur un petit parcours avant

d'y aboutir. Chez l'exemplaire suédois figuré (pl. XXVII, fig. 1) la dernière partie du canal hermaphrodite et la poche de fécondation forment un arceau, en passant insensiblement l'une dans l'autre. Dans le bas, cette poche communique avec une chambre dont la continuation forme le premier repli de l'oviducte (pl. XXVII, fig. 1, *1*). Il n'existe pas de prostate extérieure.

La glande albuminipare *(ga)* est grande, à section transversale triangulaire, se terminant en pointe, avec une profonde échancrure dans le milieu du bord inférieur, et un sillon demi-cylindrique, destiné à loger l'anse intestinale, qui, sur la face supérieure, traverse obliquement la région inférieure de la glande.

La conformation du spermoviducte étant assez complexe, celui-ci a été dessiné, vu des deux côtés (pl. XXVII, fig. 1 et pl. XXVIII, fig. 3). Les lacets supérieurs sont grands, formant des angles alternativement saillants et rentrants, les inférieurs, plus petits et plus irréguliers. Le lacet $1+2$ est le plus grand, et s'étend jusque sous la glande albuminipare et la partie lisse de l'oviducte; l'angle $(1+2)$ apparaît comme une pointe du côté columellaire (pl. XXVII, fig. 1); le sillon entre les deux côtés de cet angle *(a)* monte assez haut sur la face supérieure. Le lacet $3+4$ a, comme le précédent, la forme d'un V, mais plus petit. Le repli entre les côtés *(c)* se voit également sur la face supérieure; il s'y constate en outre un sillon peu profond entre les deux angles *(b)*. La région la plus basse de l'oviducte présente, sur sa face inférieure, 3 à 4 plis semblables à des incisions *(d, e, f, g)*, dirigés en dedans et limitant les renflements *5—7*; du côté supérieur on n'aperçoit que le dernier *(g)*, délimitant une petite partie inférieure *(7)*. Par là se termine la section femelle du spermoviducte, dont les parois sont grisâtres et à demi transparentes. La partie suivante, $8+9$, qui est blanche, opaque, appartient, à en juger par la structure de ses parois, à l'oviducte libre. Sa partie supérieure *(8)* offre un aspect vésiculaire, acineux, l'inférieure *(9)* est plus homogène et d'une couleur blanchâtre plus marquée. Toutes deux sont un peu aplaties; la supérieure *(8)* forme, en outre, le long du bord extérieur, un grand renflement sur lequel repose, chez l'exemplaire figuré, la vésicule de la poche copulatrice. Seule l'extrémité distale de l'oviducte libre (du côté distal de *9*) est étroite et se rapproche de la forme cylindrique.

La poche copulatrice prenant naissance à un point extrêmement élevé, le vagin devient très long *(va)*; il est droit, cylindrique et à parois minces. Le pédoncule de la poche copulatrice

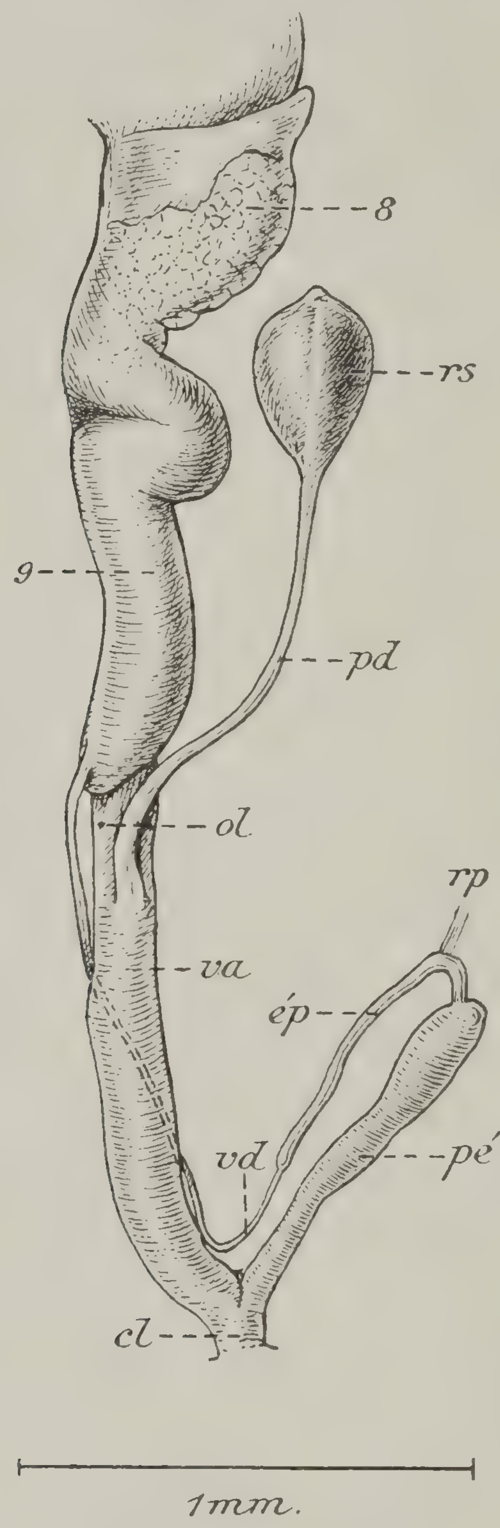


Fig. 20. Partie distale des organes génitaux de *Columella edentula* Drap. (exemplaire de «Skäralid»). — *cl*, cloaque génital; *ép*, épiphallus; *ol*, oviducte libre; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent; *8—9*, parties supérieures de l'oviducte libre.

(pd) part de la face supérieure de la voie d'excrétion femelle, du côté du pénis; il est court, un peu dilaté en bas, et débouche brusquement par le haut dans une vésicule très grande, presque globulaire (pl. XXVII, fig. 1, *rs*, et fig. 2). D'autres individus (da-

nois) possédaient un pédoncule plus gros et une vésicule piriforme ou sacculiforme (fig. 20 du texte, pl. XXVII, fig. 3, 4). La région marquée *9* est fortement contractée chez l'exemplaire reproduit dans la figure 1, pl. XXVII, et pour cette raison le pédoncule se recourbe sur la face intérieure de la vésicule. Chez d'autres exemplaires (fig. 20), où la région de l'oviducte libre ci-dessus mentionnée est tout étendue, le pédoncule suit son parcours ordinaire.

Le pénis *(pé + ép)* se compose d'une section distale, large et cylindrique *(pé)*, rétrécie auprès du cloaque génital, élargie dans l'extrémité opposée, et d'une section proximale uniforme, étroite et tubulaire *(ép)*, qui se replie en angle aigu, au point d'attache du rétracteur; cette dernière section ne constitue pas un prolongement direct de la première, distale, mais débouche dans la portion dilatée, un peu avant son extrémité libre. Le rétracteur pénien *(rp)* est d'une longueur moyenne, et se fixe, comme d'ordinaire, au diaphragme *(dp)*, dans le dernier tour de l'animal. Le nerf pénien *(np)* est très grêle; il va à la section extérieure du pénis, en projetant une branche latérale vers le canal déférent; celui-ci *(vd)* est assez court, et il décrit comme d'habitude autour du vagin les trois quarts d'une circonférence. Il s'ouvre dans l'oviducte libre, du côté columellaire, un peu au-dessus de l'endroit d'où part le pédoncule de la poche copulatrice; de là on peut le suivre, comme une raie claire, jusqu'au canal séminal du spermoviducte. De nombreux exemplaires provenant de «Ganløse Ore» (11 nov. 1921) ne possédaient pas de pénis, quelques individus recueillis à «Gurre» (26 nov. 1912) en avaient un tout à fait rudimentaire, et le pénis n'était complètement développé que chez les spécimens suédois trouvés à «Skäralid» (4 août 1922). Le cloaque génital *(cl)* est bien distinct; aucun muscle ne s'y rattache, mais la partie antérieure du rétracteur pédieux s'insère sur la peau du côté droit du corps, non loin de la base du cloaque génital.

L'espèce dont nous nous occupons a été étudiée par 3 auteurs différents. L'examen de Watson [81]), p. 275, est le plus exact, et il en a également analysé la structure histologique. Pour les points essentiels, ses résultats sont d'accord avec les miens, cependant certaines différences se remarquent. Watson a observé que les acini de la glande hermaphrodite sont réunis en un seul faisceau; pour moi, j'en ai constaté deux. Une prostate, qui se trouve indiquée

par Watson, n'a pas été observée par moi. Dans la description des exemplaires anglais, on ne parle pas de la section du pénis, semblable à un épiphallus, à laquelle se rattache le rétracteur pénien.

Les observations de Hanna[22]), p. 375—376, fig. 4, donnent l'impression d'être assez superficielles, si vraiment l'espèce examinée appartient au genre *Columella,* ce qui ne peut guère être mis en doute. Qu'il n'existe pas de cloaque génital, c'est ce qui est absolument impossible. De même, l'oviducte droit, non plissé, le long pédoncule de la poche copulatrice et le canal hermaphrodite droit, non enroulé, ne s'accordent pas davantage avec les observations faites par moi. Le seul caractère par lequel les individus américains sont tant soit peu conformes aux spécimens provenant de l'Europe septentrionale, c'est la structure du pénis: le rétracteur pénien se fixe à la section épiphallienne qui ressemble au canal déférent.

A part la poche copulatrice, la figure de Lehmann[33]), pl. XIV, fig. 49, n'a pas la moindre ressemblance avec la conformation des parties molles chez les exemplaires du *Columella* étudiés par moi; par exemple, il décrit (p. 143) et figure deux appendices péniens, d'une forme assez singulière.

Acanthinula (Zoogenetes) harpa Say.

Pl. XXVIII, fig. 1, 2, 4, 5; pl. XXIX.

L'examen a été fait sur des individus étendus, provenant de la région située au Nord de Stockholm, et recueillis au mois de septembre 1922 par le Dr Odhner.

La glande hermaphrodite (pl. XXIX, *gh*) comprend une dizaine d'acini. Ceux-ci sont disposés en deux faisceaux indistinctement séparés, 6 dans le faisceau apical, 4—5 dans l'autre; ils sont blanchâtres, sans pigment, globulaires ou piriformes. La glande est logée dans le foie supérieur, à un demi tour environ de l'extrémité du sac viscéral; elle n'est pas très profondément enchâssée dans le foie, mais n'est visible, toutefois, que sur les faces supérieure et intérieure du tour. Le canal hermaphrodite *(dh)* est de longueur moyenne, non enroulé dans la moitié proximale, fortement enlacé, au contraire, dans la distale, qui est blanche et à reflets soyeux; aucune de ces deux moitiés n'est pigmentée.

La glande albuminipare *(ga)* est d'un blanc pur et composée d'acini assez grands. Elle est très petite, courte, carrée, et sans dépressions pour les circonvolutions intestinales, qui ont leur parcours dans le foie inférieur, bien développé et fortement ramifié.

La poche de fécondation (pl. XXVIII, fig. 1, 2, *pf*) est située sur la face supérieure et intérieure de la glande albuminipare; elle est droite, un peu dilatée et courbée à l'extrémité supérieure où débouche le canal hermaphrodite, duquel elle se distingue nettement. Sa région inférieure passe dans une partie blanche, fortement développée *(am)*, qui se continue directement dans le canal séminal *(cs)*. Au côté extérieur de la partie dilatée et à l'extrémité supérieure du canal séminal se rattache la prostate *(pr)*; celle-ci est constituée par une série de culs-de-sac étroits, de dimensions différentes. Chez un exemplaire on en a compté 8, chez un autre, 7; ils sont tantôt serrés l'un contre l'autre, tantôt plus séparés.

Le spermoviducte est très développé chez cette espèce, et en grande partie transformé en un sac à parois extrêmement minces: l'utérus *(ut)*, qui, chez les grands exemplaires, se trouve rempli d'embryons dont le nombre et la taille sont variables. L'exemplaire figuré (pl. XXIX) en renfermait 5, dont les supérieurs n'étaient pas encore développés, tandis que l'inférieur présentait une coquille d'un tour et demi. La région tout en haut de l'oviducte est transformée en une chambre d'albumine (pl. XXVIII, 2, *ch*), semblable à celle des Clausilies. Elle est blanche et aplatie, à l'embouchure *(ou)* tournée vers le bas et un peu en dehors. Bien que l'oviducte ne soit pas très large à cet endroit, la chambre n'en occupe cependant pas la région supérieure dans toute sa largeur, mais apparaît comme une poche blanche, à parois épaisses, et pressée contre la partie inférieure, élargie, de la poche de fécondation *(am)*, avec laquelle elle communique par une fente allongée *(ft)*. Dans l'angle supérieur et extérieur de la chambre débouche la glande albuminipare *(x)*. Ainsi que nous l'avons mentionné plus haut, c'est certainement dans cette chambre que la cellule ovulaire fécondée s'enveloppe de sa couche d'albumine, ainsi que de la coque.

Vu que le canal déférent *(vd)* s'ouvre dans le canal séminal *(cs)* à une assez grande distance de l'extrémité inférieure de l'utérus *(ut)*, il faut supposer que la région supérieure de l'oviducte libre *(ol)* est comprise dans la formation de celui-ci; le reste est,

comme le vagin *(va)*, court et cylindrique; comme il n'existe pas de pénis, on ne peut préciser où finit le cloaque génital et où commence le vagin. Sur la limite entre le tiers supérieur et le tiers moyen du tube représentant le cloaque génital, le vagin et la partie inférieure de l'oviducte libre, saillit le gros pédoncule de la poche copulatrice *(pd)*. Celui-ci court, parallèlement au canal séminal, le long du côté concave du spermoviducte et se termine en une vésicule *(rs)*, couverte et aplatie par le muscle columellaire. Le quart supérieur de la poche copulatrice, constitué par la vésicule, se recourbe un peu vers le côté, de façon que celle-ci forme avec le pédoncule un angle de 135^0. A la courbure, le pédoncule est un peu élargi et aplati (pl. XXVIII, fig. 5). Chez un seul individu (fig. 4) il se constatait à cet endroit un cul-de-sac assez considérable (diverticule, *di*). Il existe donc dans cette espèce une variation semblable à celle qui s'observe chez le *Pupilla muscorum.*

Le canal déférent (pl. XXIX, *vd*) n'apparaît que comme un tube très court, un peu sinueux, qui est étendu chez quelques exemplaires et chiffonné chez d'autres; il se termine en cul-de-sac un peu dilaté. L'orifice génital (pl. XXIX, *og*) est grand et situé très en arrière, non pas, comme à l'ordinaire, sous la base de l'ommatophore, mais presque tout à fait sous le pneumostome. A la base du cloaque génital, ou plutôt à la peau qui entoure l'orifice génital, se rattache un nerf prenant naissance sur le côté du ganglion pédieux, assez haut, entre l'otocyste et les connectifs (c. cérébro-pédieux et pleuro-pédieux). Le nerf génital part, comme nerf intestinal, du revers du ganglion viscéral entre l'oviducte et les glandes salivaires, et longe le mince diaphragme; il suit alors la face inférieure de l'utérus jusqu'à la glande albuminipare, d'où, après avoir envoyé à celle-ci une branche latérale, il se continue le long de la poche de fécondation et du canal hermaphrodite jusqu'à la glande hermaphrodite. Aucune musculature ne se rattache à l'appareil génital.

Tube digestif.

Pl. III, fig. 2; pl. XXX, fig. 1, 3, 4; pl. XXXI, fig. 1—3; fig. 21 et 22 du texte.

Si on fait abstraction des parties du pharynx formées par la conchioline: mâchoire et radule, les variations que présente dans la famille le tube digestif ne sont pas grandes, et les différences qui existent dans le nombre des circonvolutions intestinales et dans

les dimensions relatives sont dues principalement à la forme du sac viscéral (et de la coquille). Par conséquent, nous n'allons étudier, dans ce qui suit, que deux types: un type plus grand, avec

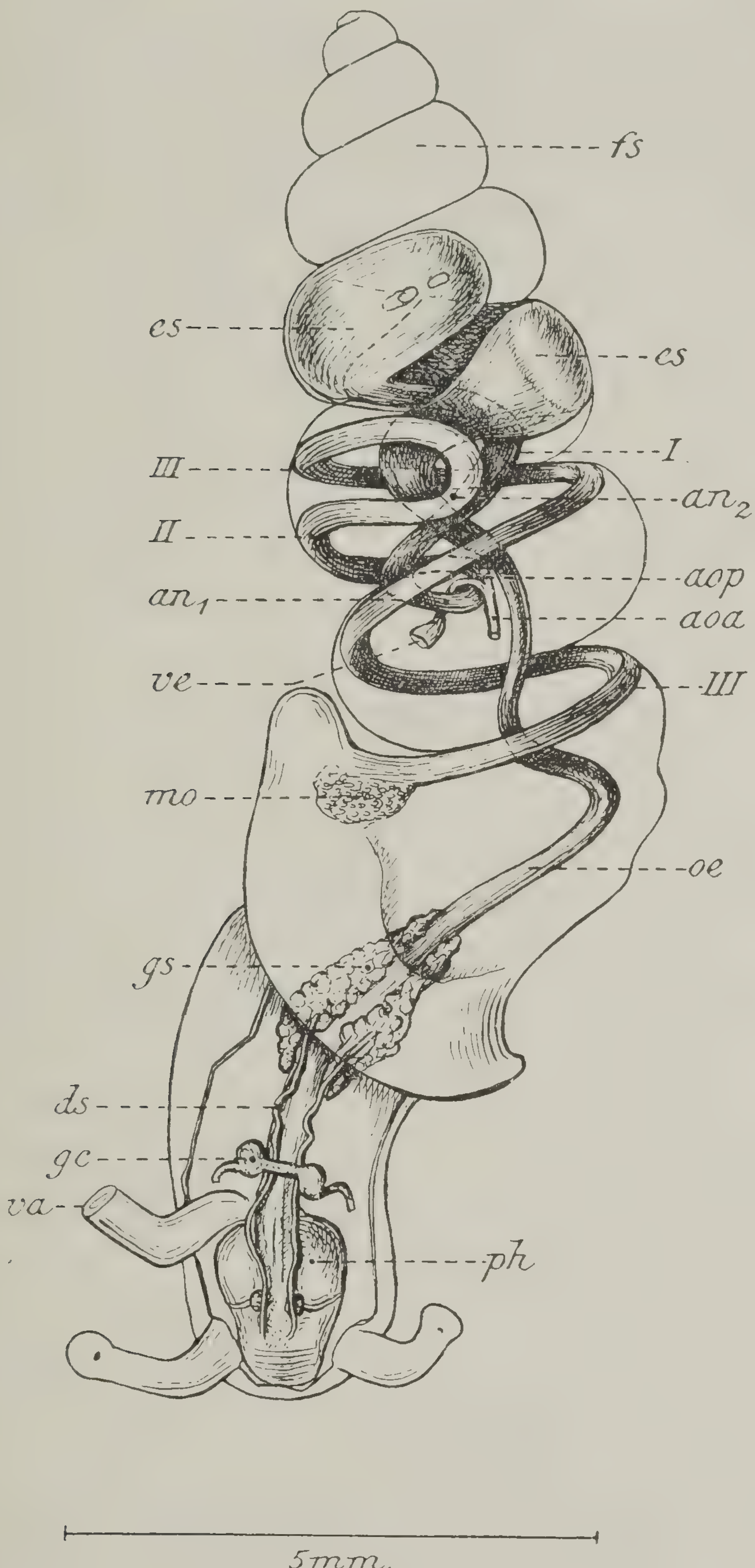


Fig. 21. Tube digestif de *Chondrina similis* Brug., in situ. — *an*1, *an*2, 1re et 2e anses intestinales; *aoa*, aorte antérieure; *aop*, aorte postérieure; *ds*, conduit excréteur de la glande salivaire; *es*, estomac; *fs*, foie supérieur; *gc*, ganglion cérébroïde; *gs*, glande salivaire; *mo*, organe de Mermod; *oe*, œsophage; *ph*, pharynx; *va*, vagin; *ve*, ventricule; I—III, diverses parties de l'intestin.

une spire plus élevée et à tours plus nombreux (*Abida secale*, pl. XXX, fig. 4, et *Chondrina similis*, fig. 21 du texte), et un autre plus petit, n'offrant qu'un nombre restreint de tours (*Vertigo moulinsiana*, pl. XXX, fig. 3).

Chez toutes les espèces dont les individus ont été examinés à l'état d'extension, le grand pharynx, bien développé (fig. 21 du texte, *ph*, et pl. XXX, fig. 4), est situé en avant du collier œsophagien, de façon que l'œsophage *(oe)* et les conduits excréteurs des glandes salivaires *(ds)* le traversent. Un peu en arrière des ganglions cérébroïdes *(gc)* commencent les glandes salivaires *(gs)*, qui entourent l'œsophage des deux côtés; ce sont des corps allongés, à bord finement lobé, dont le conduit excréteur *(ds)* prend naissance à une petite distance de l'extrémité antérieure de la glande (pl. XXII, fig. 4—6). A la limite du sac viscéral, l'œsophage se dégage des glandes pour suivre le muscle columellaire le long de la columelle jusqu'à l'estomac (pl. XXX, fig. 3, 4, et fig. 21 du texte, *oe*). A l'extérieur il ne s'aperçoit pas de limite bien accentuée entre ces deux parties; l'œsophage s'élargit peu à peu, et ce n'est que lorsque le tube digestif arrive à la surface des tours, que l'estomac atteint la largeur qu'il conserve dans toute la suite de son parcours, c'est-à-dire qu'il occupe toute la hauteur du tour *(es)*. La partie apicale de l'estomac se termine en s'arrondissant brusquement. Sa région postérieure (pl. III, fig. 2, *chp*) est en partie séparée de l'antérieure, plus grande, par un pli transversal en croissant. Ce pli *(pl)* commence sur la paroi supérieure de l'estomac, traverse la paroi interne en s'élevant de plus en plus, et se continue jusque sur la paroi inférieure. Dans la région postérieure *(chp)* se voient trois ouvertures; deux se trouvent en haut; l'antérieure *(ofi)*, située juste en arrière du pli transversal, constitue l'orifice du foie inférieur; la postérieure, qui est aussi la plus grande *(ofs)*, celui du foie supérieur. La troisième ouverture *(oi)* est placée en avant, sur la face interne, et elle est en partie cachée par le pli; elle conduit dans l'intestin.

La première partie de l'intestin a un parcours compliqué. Chez l'un des types *(Abida, Chondrina)*, elle forme une fronde allongée (pl. XXX, 4, et fig. 21, an_1); celle-ci parcourt d'abord deux tours en descendant de l'estomac *(I)*, puis elle se replie pour remonter, par un des tours *(II)*, le long de la branche descendante et appa-

raît enfin à la surface juste en avant de l'estomac. La courbure de la fronde intestinale *(an_1)* est toujours fixée — comme chez la plupart des autres Pulmonés — à l'aide de l'aorte (fig. 21 du texte) qui, à cet endroit, venant du cœur *(ve)*, décrit une courbe par-dessus l'intestin, pour se diviser ensuite en deux branches, l'une antérieure *(aoa)*, l'autre postérieure *(aop)*. Chez le second type *(Vertigo)*, la fronde (pl. XXX, fig. 3, *I—II*) est très courte et très large. En avant de l'estomac, l'intestin constitue, chez les deux types, une anse en forme d'U, l'ouverture tournée en bas (dans la direction du collier palléal), la partie fermée, en haut (pl. XXX, fig. 3, 4; fig. 21, an_2). Cette anse est, dans sa plus grande étendue, située à la surface, et c'est elle qui a son emplacement dans la glande albuminipare. De là l'intestin se continue, sous le nom de rectum *(III)*, le long du bord supérieur des tours jusqu'au pneumostome (pl. XXX, fig. 3, *op*). Quant à sa longueur, il existe, entre les deux types, la différence suivante: Chez les *Chondrina* et les *Abida*, l'œsophage parcourt deux tours et demi, chez les *Vertigo* seulement deux; le rectum a de même, chez ces derniers, une étendue un peu moindre.

Le foie ou, plus correctement, l'hépato-pancréas, se compose de deux parties bien séparées. L'une, le foie supérieur (pl. XXX, fig. 3, 4, et fig. 21, *fs*), occupe tout le sommet du sac viscéral et parcourt de 4 à 5 tours. Elle est, en général, assez compacte, mais sa région inférieure peut, par exemple chez les *Vertigo* (pl. XXXI, fig. 3, *fs*), être divisée en lobes, qui tous débouchent dans un conduit excréteur commun, à grande lumière *(cfs)*; celui-ci accompagne la columelle et s'ouvre, par le grand orifice ci-dessus mentionné, dans la région postérieure de l'estomac (pl. III, fig. 2, *ofs*). Entre les lobes hépatiques inférieurs s'aperçoit la glande hermaphrodite (pl. XXXI, fig. 3, *gh*). La seconde partie, le foie inférieur (pl. XXX, fig. 1; pl. XXXI, fig. 1—3; fig. 22 du texte, f, f_1, f_2, f_3), est beaucoup plus complexe; elle est fortement lobée et entaillée, et occupe l'espace compris entre la surface du sac viscéral, l'estomac, les circonvolutions intestinales et la glande albuminipare. Elle comprend deux moitiés, l'une supérieure *(f)*, l'autre inférieure (f_1, f_2, f_3); de la limite qui les divise, part le long conduit excréteur, en forme de tube *(cfi)*, qui longe la columelle au-dessous de la région antérieure de l'estomac, pour s'engager ensuite dans l'angle situé entre la première

partie de l'intestin et la région postérieure de l'estomac, dans laquelle il débouche derrière le pli en croissant, mentionné plus haut (pl. III, fig. 2, *ofi*). La moitié supérieure de la glande même *(f)* s'étend comme un corps aplati, linguiforme, le long du côté inférieur de l'estomac, pour s'enfoncer à la fin comme un coin entre la partie postérieure de celui-ci et le commencement de l'intestin. La moitié inférieure (f_3) est située dans la première fronde

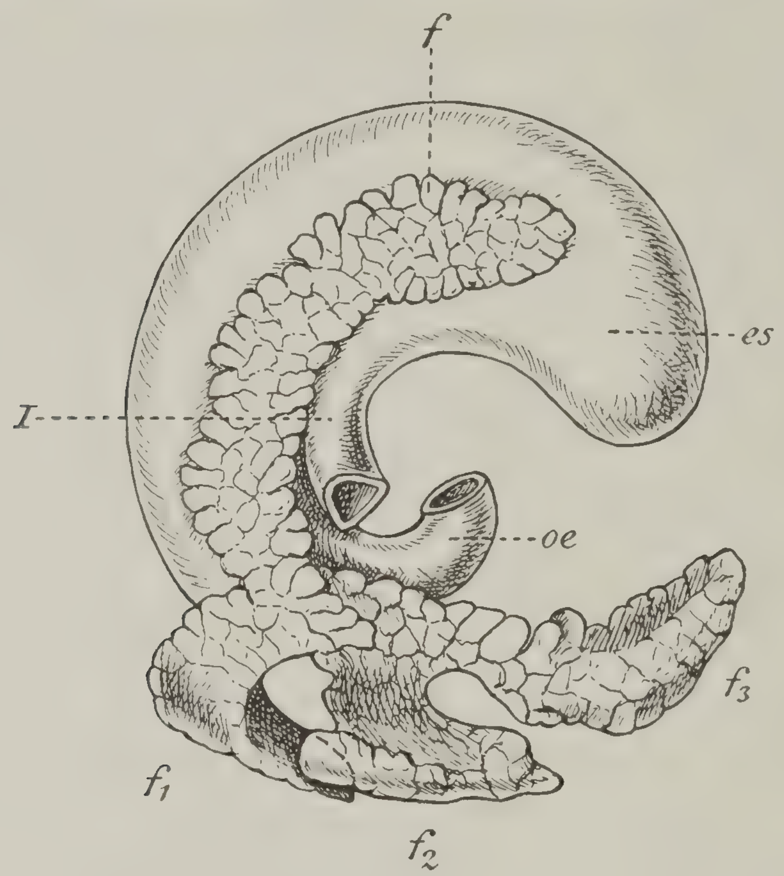


Fig. 22. Estomac et foie inférieur de *Lauria cylindracea* D. C. × c. 35. — *es*, estomac ; *f*, f_1, f_2, f_3, les 4 lobes du foie inférieur ; *oe*, œsophage ; *I*, partie postérieure (apicale) de la première anse de l'intestin.

intérieure de ce dernier, d'où elle envoie, à la surface du tour, 2 lobes dont l'un s'avance dans la seconde anse superficielle de l'intestin (f_2), et l'autre, dans l'espace entre celui-ci et la région antérieure de l'estomac (f_1). Les deux régions principales du foie inférieur sont, chez le *Chondrina similis,* fortement découpées ; la première partie du canal excréteur renferme aussi des follicules glandulaires (pl. XXX, fig. 1, *cfi*).

L'appareil digestif des espèces ci-dessus mentionnées, n'a jamais été décrit ni figuré dans la littérature malacologique, excepté celui du *Chondrina similis.* Les figures de Moquin-Tandon[41]), pl. 25, fig. 17, 18, représentant les organes digestifs de celui-ci, ne sont pas très exactes ; l'aspect des glandes salivaires est même tout à

fait défectueux, et le dessin de la région postérieure de l'estomac n'est pas non plus très correct. Les autres figures de Moquin-Tandon, reproduisant l'appareil digestif chez les divers représentants de la famille des *Pupillidae*, ont aussi peu de valeur: *Chondrina megacheilos*, pl. 25, fig. 25; *Lauria cylindracea*, pl. 27, fig. 43; *Vertigo pygmæa*, pl. 28, fig. 40; *Vallonia pulchella*, pl. 11, fig. 29, 30. Les figures que donne Lehmann[33]) du canal digestif du *Lauria cylindracea*, pl. 13, fig. 48, du *Pupilla muscorum*, pl. 14, fig. 50, et du *Truncatellina costulata*, pl. 14, fig. 51, n'en ont pas davantage. Les descriptions et les figures dont on peut faire l'application, sont les suivantes: Chez Hesse[30]), *Orcula batumensis*, p. 3, et *Orcula orientalis*, p. 7, pl. 1, fig. 8. Hanna[22]) parle des glandes salivaires du *Columella edentula*, p. 375; elles sont indiquées comme étant soudées l'une à l'autre, mais possédant deux conduits excréteurs. Soós[62]) décrit et figure tout le tube digestif de l'*Aspasita triaria*, p. 65 et 147, fig. 39. Chez Sterki[67]) se trouve mentionnée la couleur du foie du *Vallonia pulchella*, p. 237, et de plusieurs formes américaines. Hesse[26]) a décrit le tube digestif du *Pyramidula rupestris*, p. 115, et Steenberg[65]) décrit et figure l'intestin, l'estomac et le foie chez le *Vallonia costata*, p. 12—13, fig. 7. Watson[80]) enfin compare (p. 14) les tubes digestifs d'*Acanthinula*, de *Vallonia*, de *Patulastra balmei* et de *Pyramidula rupestris*, et donne des figures d'ensemble de la position de ces organes chez le *Vallonia excentrica* (pl. I, fig. 1) et chez le *Pyramidula rupestris* (pl. II, fig. 3).

Radule.

Il a été traité de cet organe au sujet des représentants de tous les genres dont les organes génitaux ont été examinés.

Chondrina similis Brug.

Fig. 23 du texte.

La radule est constituée par une membrane basilaire, sur laquelle sont disposées environ 112 rangées transversales, légèrement arquées, dont les dents sont placées selon la formule: 34—1—34 ou 11—23—1—23—11. La dent rachiale symétrique est nettement située un peu en arrière de la ligne formée par les dents

latérales. La plaque basilaire est rectangulaire, munie d'un support dentaire vigoureux, sur lequel repose une cuspide large et forte; les pointes latérales font défaut, mais sur les angles du support se voit toujours une saillie toute petite. Les 6 ou 7 premières dents latérales présentent une structure analogue, à l'exception de la plaque basilaire et du support dentaire, qui ne sont pas symétriques, mais un peu irréguliers, et de la petite saillie intérieure du support qui tend à disparaître. En revanche, l'angle latéral de ce dernier s'accentue de plus en plus, et sur les dents

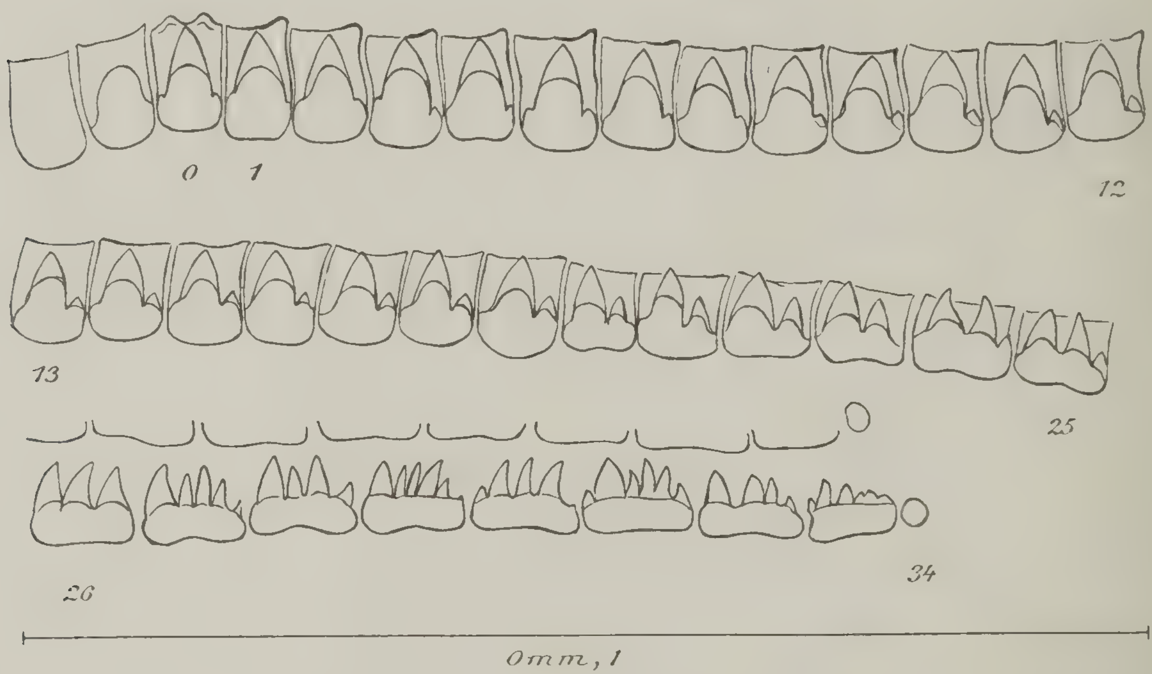


Fig. 23. Radule de *Chondrina similis* Brug. Moitié gauche d'une rangée transversale qui, faute de place, a été coupée en 2 endroits; dans la partie extérieure (dents 26—33), le bord antérieur des plaques basilaires, appartenant à la rangée transversale suivante, a été dessiné pour montrer la distance entre ces rangées. — *0*, dent centrale ou rachiale; *1—23*, dents latérales; *24—34*, dents marginales.

latérales extérieures se développe à cet endroit une petite cuspide externe (l'ectocone). Pour les dernières dents latérales, la plaque basilaire est devenue à peu près carrée, et la cuspide externe (l'ectocone), très vigoureuse; sur la dent de transition (23), celle-ci est même d'une taille presque égale à celle de la cuspide principale (le mésocone). Les plaques basilaires des dents marginales sont basses et larges; en dehors de l'ectocone se développe une nouvelle cuspide latérale, qui, sur le n° 26, prend les mêmes dimensions que les deux autres. Les dents marginales extérieures ont un caractère plus irrégulier, des pointes accessoires apparaissant non seulement sur le côté extérieur de la dent, mais aussi intérieurement et quelquefois même entre les cuspides prin-

cipales. La dent extrême (nº 34) est toute petite et rudimentaire, sans support et sans cuspides.

Wiegmann[87]), p. 12, a décrit la radule de l'espèce dont nous nous occupons. Le nombre des dents de la rangée transversale et la plupart des traits de la structure s'accordent exactement avec les observations faites par moi, mais Wiegmann a remarqué une plus grande quantité de rangées transversales, 130 à 177, et il indique que quelquefois les 3 cuspides peuvent déjà être constatées sur la dent nº 20. Pour ce qui concerne la conformation de la radule, Gwatkin[21]), p. 228, et Westerlund (Schacko)[84]), p. 167, rangent l'espèce dans le groupe: *avenacea-megacheilos*. La figure de Pollonera[52]), pl. IV, fig. 16, n'est pas réussie, et il est fort douteux que les dents reproduites appartiennent vraiment à cette espèce.

Chondrina avenacea Brug.

Fig. 24 et 25 du texte.

Il existe 145 rangées transversales de dents, disposées d'après les formules: 34—1—34 ou 7—27—1—27—7.

Comme chez l'espèce précédente, la dent rachiale est un peu reculée par rapport aux dents latérales. Les plaques basilaires sont, pour les dents rachiales aussi bien que pour les latérales, un peu plus allongées que chez le *Chondrina similis*, mais la différence n'est cependant pas grande. Toutes ces dents manquent de cuspides latérales, et même les saillies des angles du support ne s'aperçoivent, en général, qu'assez loin dans la rangée des dents, environ au nº 16. Depuis la dent 17 ou 18 apparaît une première cuspide extérieure (ectocone); ces cuspides s'accroissent graduellement à mesure qu'elles se rapprochent du côte extérieur. Les dents 22 à 27 ont l'ectocone et le mésocone à peu près égaux. En même temps que l'ectocone s'accroît, la plaque basilaire se raccourcit (17—22) et devient carrée, jusqu'à ce qu'enfin toute la partie postérieure disparaisse, et que seule la partie antérieure avec le support dentaire raccourci forme l'appui des cuspides (de 23 à 27). La limite entre les dents latérales et les marginales est fixée à l'endroit où apparaissent les pointes accessoires (dent 28). Celles-ci se voient toujours entre les cuspides principales, et souvent aussi du côté extérieur. Le plus grand nombre de cuspides observées sur

une dent est de 4. Les deux dents extérieures de chaque moitié des rangées sont rudimentaires.

Si l'on compare la fig. 24 de cet ouvrage avec celle de Lindstrøm[34]), pl. 1, fig. 13, on aperçoit une différence considérable. En particulier on ne retrouve pas les plaques basilaires très étroites, postérieurement terminées en une pointe légèrement courbée en

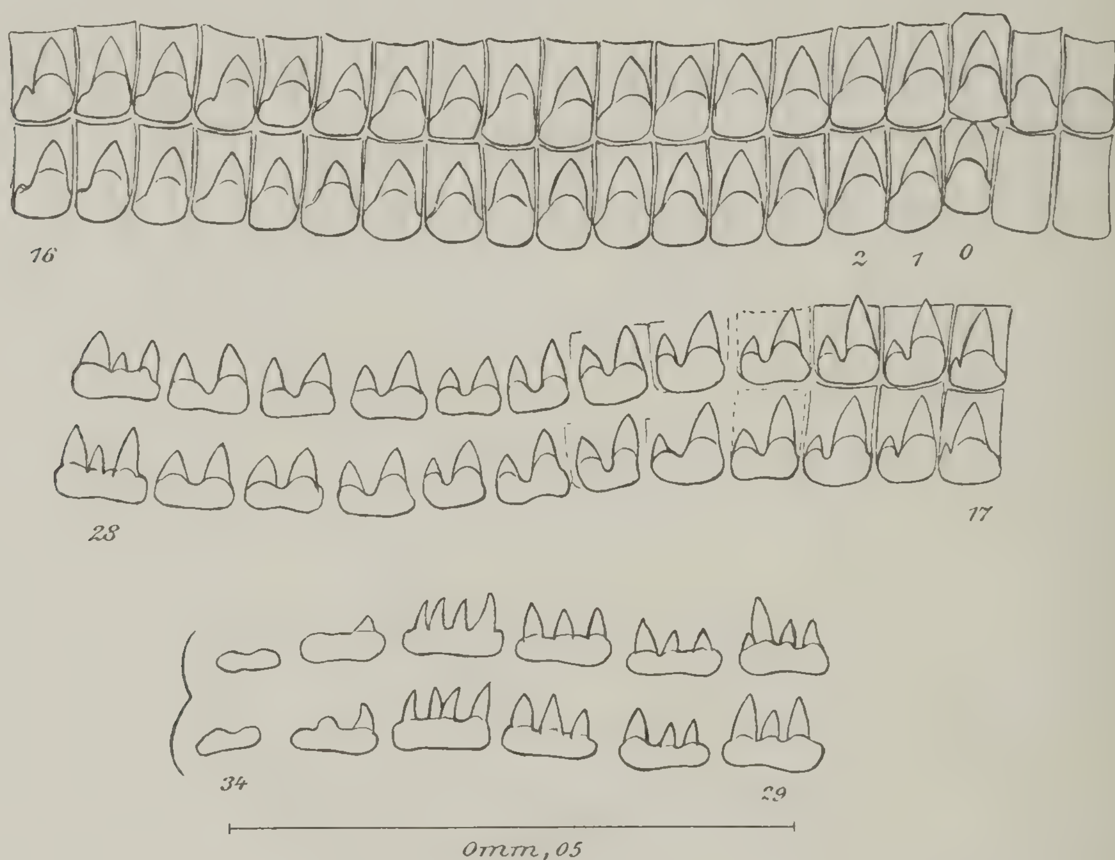


Fig. 24. Deux rangées transversales du côté droit de la radule chez *Chondrina avenacea* Brug. — *0*, dent rachiale; *1—27*, dents latérales; *28—34*, dents marginales.

dehors, et à espaces intermédiaires assez grands, telles que les reproduit cet auteur. Par un examen plus minutieux de plusieurs radules, j'ai constaté cependant que les membranes radulaires en forme de cuiller renversée se couchent souvent pendant la préparation en formant des plis transversaux, de sorte qu'on arrive à observer les dents du côté antérieur du pli, complètement de derrière (fig. 25 *A* du texte, *I*), et celles du côté postérieur du pli, par leur côté de devant *(II)*. L'image de cette dernière rangée rappelait beaucoup plus la figure de Lindstrøm que la fig. 24 du présent travail. Pour mieux comprendre la structure dentaire, j'ai préparé quelques dents isolées (fig. 25, *B* et *C*). Celles-ci se composent d'une plaque basilaire, rectangulaire *(a)*, du support dentaire *(b)*, et de la plaque dentaire tranchante *(c)*, qui forme ordinairement un angle très aigu

avec la basilaire. Dans ma figure elle n'est qu'un peu inclinée en arrière, et forme, à sa base, un angle à peu près droit avec cette dernière. La plaque dentaire, tranchante, est appuyée par un soutien vigoureux, le support ou l'appui dentaire *(b)*, qui monte seulement à une certaine hauteur sur sa face postérieure. Si, par suite d'une formation de plis, la rangée transversale des

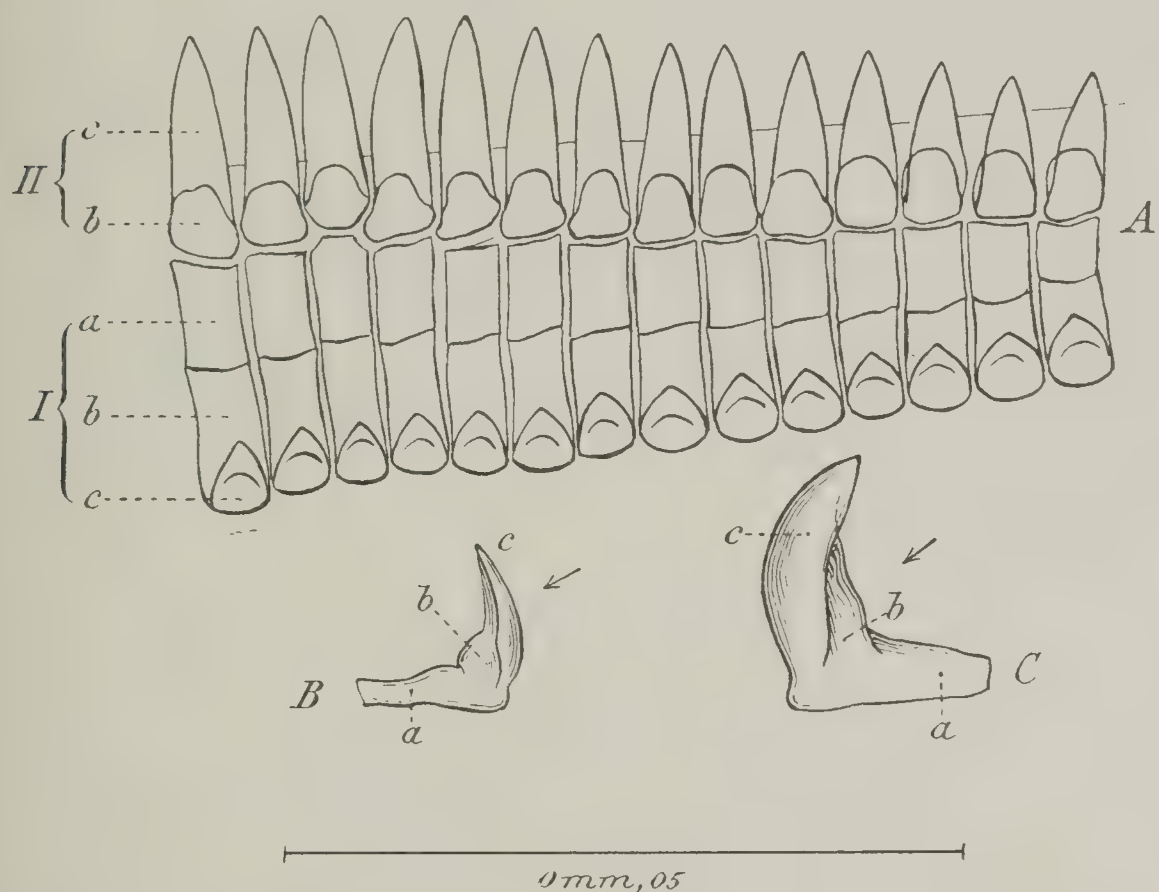


Fig. 25 *A*. Partie de 2 rangées transversales de la radule chez *Chondrina avenacea* Brug.; il est figuré un endroit où la radule forme un pli tourné vers l'observateur. Dans la rangée *I*, les dents sont vues par leur face postérieure, dans la rangée *II*, par la face antérieure. — Fig. *B* et *C*. Deux dents isolées, vues de côté. Les flèches indiquent la direction dans laquelle les rangées *I* et *II* (*A*) ont été observées. La rangée *II* est regardée comme le montre la fig. *B*, la rangée *I* comme dans la figure *C*. — *a*, plaque basilaire; *b*, support dentaire; *c*, plaque dentaire.

dents s'est tournée de façon qu'on la regarde dans la direction indiquée par la flèche de la fig. 25 *C*, on voit justement l'image que présente la rangée de dents du côté antérieur du pli (fig. 25 *A*, *I*), apercevant d'abord la partie postérieure de la plaque basilaire *(a)*, puis le support *(b)*, et enfin la cuspide *(c)*. Si on observe les dents par devant et de biais (comme l'indique la flèche de la fig. 25 *B*), on voit les plaques dentaires *(c)* se présenter dans toute leur étendue, tandis que les supports *(b)* s'aperçoivent en bas et en avant, correspondant à la rangée de dents sur le côté postérieur du pli (fig. 25 *A*, *II*). C'est évidemment de cette manière que L i n d s t r ø m

a regardé la demi-rangée qu'il a figurée, et il a pris comme plaques basilaires, ce qui représente réellement les plaques dentaires (cuspides), et comme cuspides, les supports qui se distinguent à travers les plaques. C'est la seule manière dont je puisse m'expliquer ses figures et les faire accorder avec les miennes. Soós, qui a donné une description de la radule[62]), p. 58 et 145, a figuré de même quelques dents provenant d'une rangée transversale (fig. 33); cette figure est bien conforme à la fig. 24 de la présente étude, seulement les dents ont été observées un peu plus par derrière que sur celle-ci, raison pour laquelle les plaques dentaires apparaissent un peu plus courtes, et les plaques basilaires relativement plus longues. Le nombre des dents de la demi-rangée est indiqué à 35—36.

Chez Gwatkin[21]), p. 228, la radule du *Chondrina avenacea* a été rapportée au groupe du *Pupa megacheilos*, et Westerlund[84]), p. 167, en a fait le type d'un groupe d'espèces du genre *Pupa*.

Abida secale Drap.

Fig. 26 du texte.

Chez l'exemplaire figuré la formule dentaire est: 135 × (19—1—19) ou 135 × (6—13—1—13—6); le nombre de dents de chaque rangée transversale varie cependant un peu. La plus grande quantité qui ait été observée est de 21—1—21.

La plaque basilaire de la dent rachiale n'est que légèrement reculée par rapport à la première dent latérale; elle est un peu plus longue que large, ce qui est aussi le cas pour les dents latérales intérieures; vers l'extérieur les plaques basilaires deviennent de plus en plus courtes et enfin carrées; sur les dents latérales extérieures elles ont presque complètement disparu. Les dents marginales n'ont pas d'ordinaire de plaques basilaires, sauf la partie formée par le support dentaire, court mais large.

La dent rachiale n'a qu'une seule cuspide principale, qui est très large et très forte. On peut observer quelquefois le léger commencement de deux pointes latérales, mais celles-ci ne semblent alors formées que par le support dentaire. Les dents latérales portent toutes deux cuspides, dont le mésocone est vigoureux et de la même longueur que celui de la dent rachiale, ou quelquefois plus long, tandis que l'ectocone est considérablement plus petit, mais également large et fort.

Les dents marginales présentent 3—5 cuspides, de taille très variable. Parmi celles-ci on est toujours en mesure de reconnaître laquelle est le mésocone, et souvent aussi laquelle est l'ectocone. La dent marginale extérieure est rudimentaire et irrégulière.

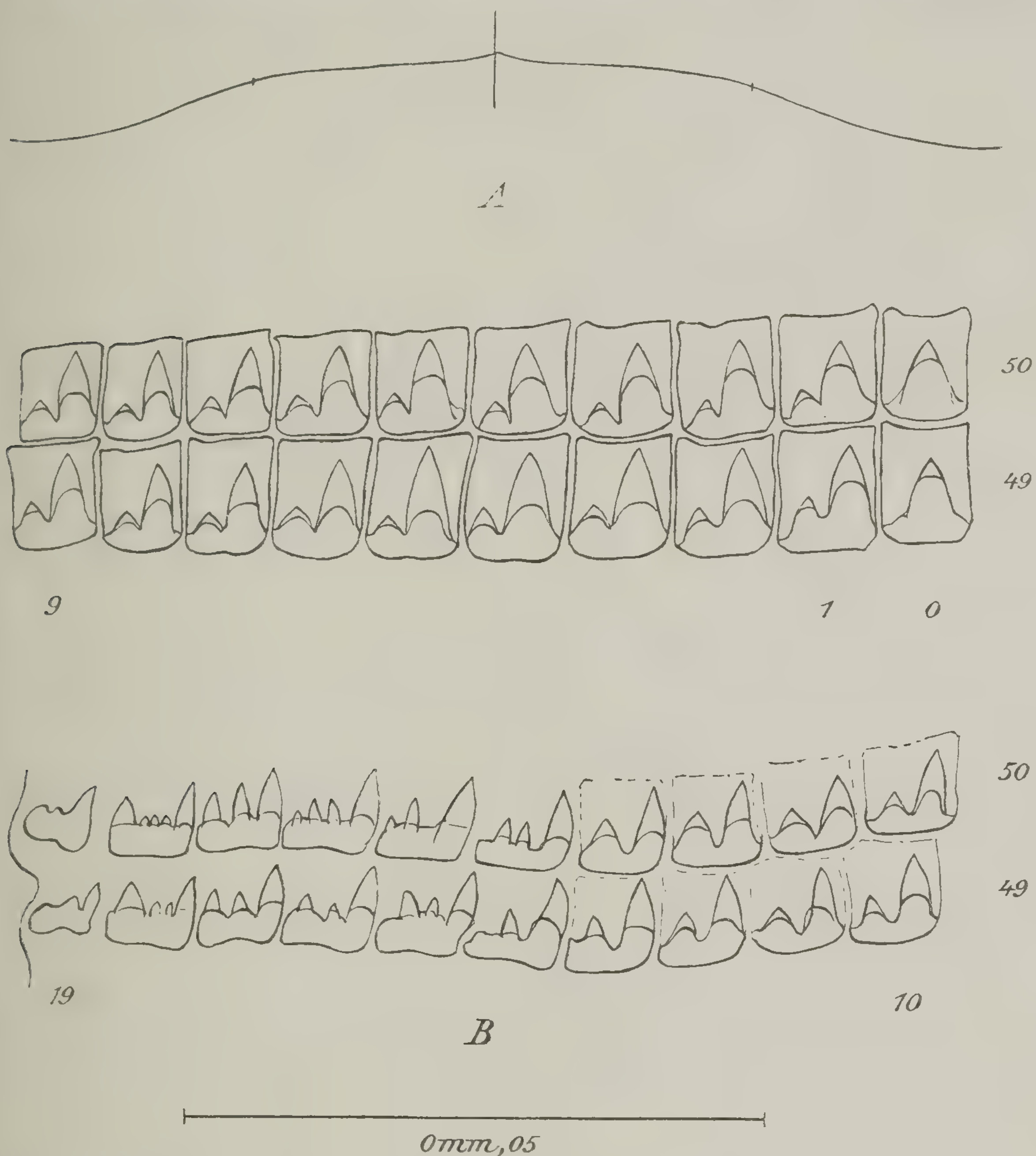


Fig. 26 *A*. Ligne indiquant la forme d'une rangée transversale de dents de la radule de l'*Abida secale* Drap. — Fig. *B*. Radule de la même espèce. Moitié droite des rangées transversales 49 et 50. — *0*, dent rachiale ; *1—13*, dents latérales ; *14—19*, dents marginales.

Pilsbry[51]), vol. 24, p. 265, indique qu'il a observé env. 12 dents latérales ; à part cela, sa courte description s'accorde exactement avec la mienne.

Sandahlia cylindrica Mich.

Fig. 27 du texte.

Les dents de chaque rangée transversale sont disposées en forme d'arc d'arbalète assez régulier (fig. 27 *A*). Il se constate 125 à

130 rangées suivant la formule: 19—1—19 ou 9—10—1—10—9. Dans la figure sont dessinées les dents rachiales et la moitié gauche des rangées 57 et 58, ainsi que deux plaques basilaires du côté droit, appartenant aux dents latérales 1 et 2. La dent rachiale n'est pas plus reculée que les deux dents latérales avoisinantes.

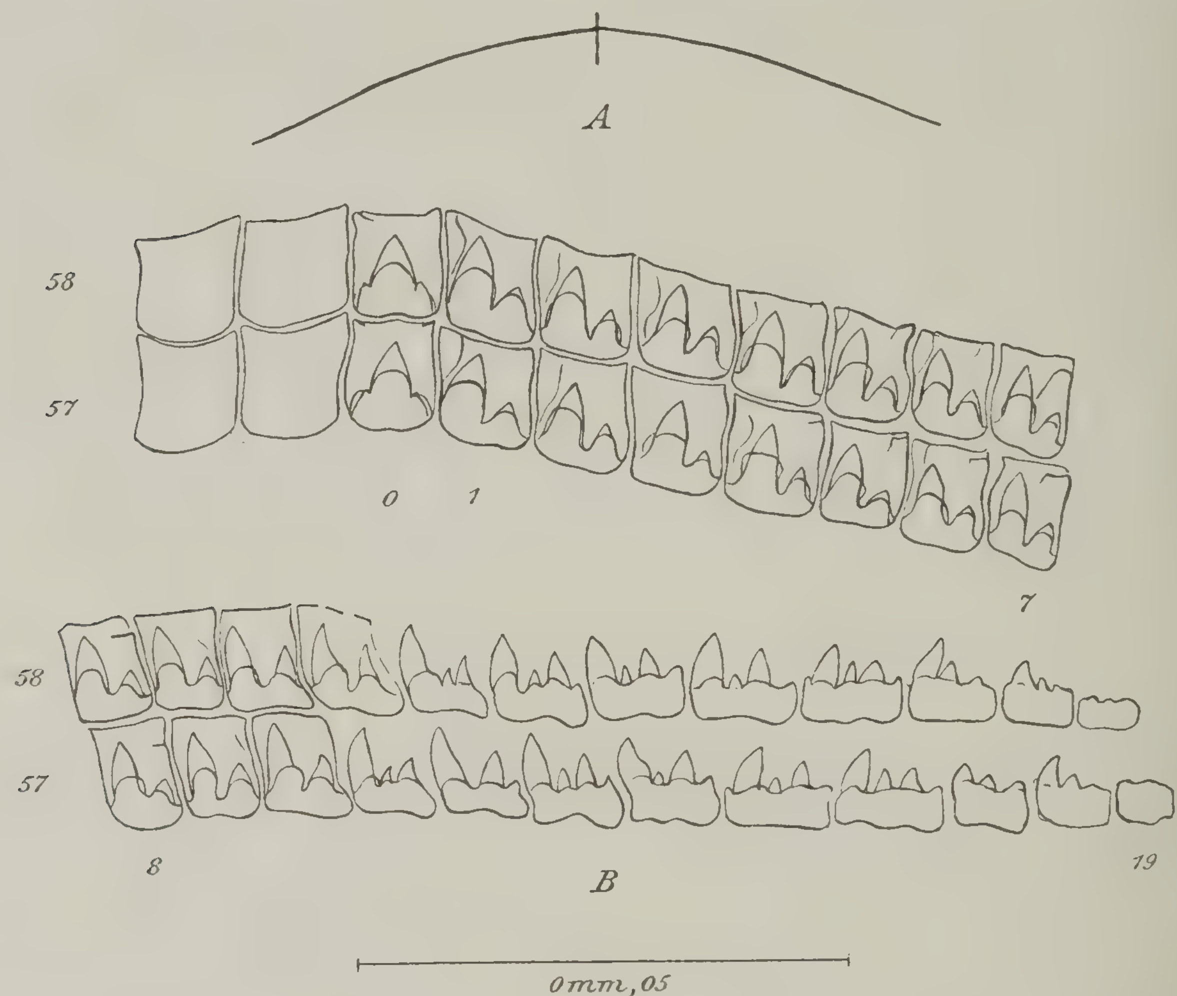


Fig. 27. Radule de *Sandahlia cylindrica* Mich. — Fig. *A* montre la disposition des dents dans une rangée transversale. — Fig. *B*. Moitié gauche des rangées transversales 57 et 58. — *0*, dent rachiale; *1—10*, dents latérales; *11—19*, dents marginales.

Les plaques basilaires sont carrées, un peu plus longues que larges. La dent centrale (rachiale) porte, outre la cuspide principale, assez courte et vigoureuse, 2 petites pointes latérales. Les dents latérales ont toutes la même structure, non symétrique, et présentent une forte cuspide principale (mésocone), et un ectocone bien développé, mais plus petit. Les dents marginales ont la plaque basilaire et le support dentaire courts et larges. Pour presque toutes les dents de la rangée se constatent une cuspide principale (mésocone) et un ectocone, mais pour la plupart des dents marginales il s'y ajoute encore 1 à 2 pointes accessoires, l'une entre le mésocone et l'ectocone, l'autre du côté extérieur de l'ectocone; la dernière des dents marginales n'est que rudimentaire.

Orcula dolium Drap.

Fig. 28 du texte.

Le nombre des rangées transversales est de 92; chacune de celles-ci a la forme d'un arc d'arbalète (fig. 28 *A*). La formule des dents est: 19—1—19 ou 11—8—1—8—11.

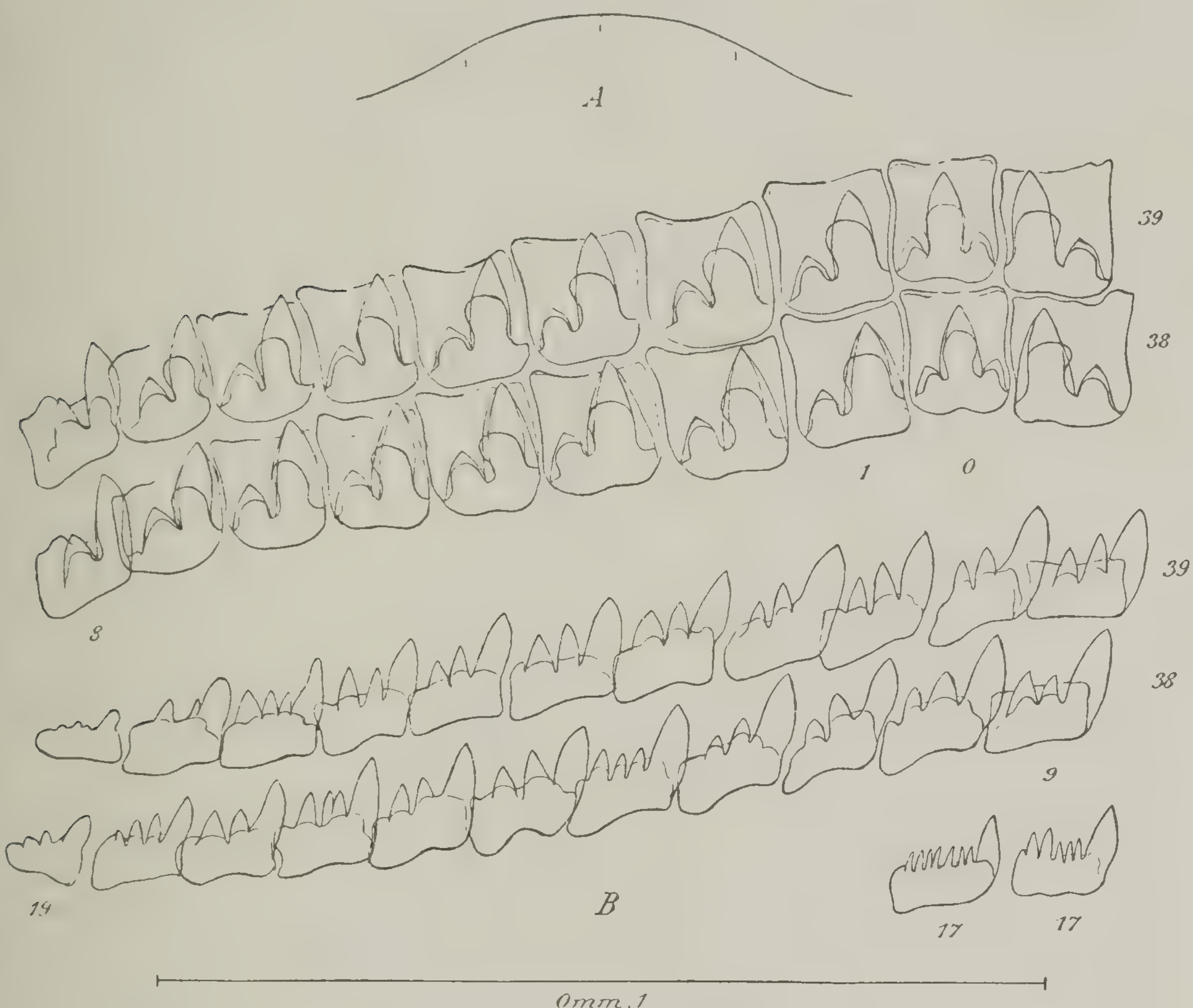


Fig. 28. Radule d'*Orcula dolium* Drap. — Fig. *A* montre la disposition des dents dans une rangée transversale. — Fig. *B*. Deux demi-rangées du côté droit (38 et 39). A droite, au coin inférieur, deux dents appartenant à la 17e rangée longitudinale et provenant d'une autre partie de la même radule. *0*, dent rachiale; *1—8*, dents latérales; *9—19*, dents marginales.

La dent rachiale est un peu reculée par rapport aux premières dents latérales. Sa plaque basilaire, aussi bien que celles des latérales, se rapprochent beaucoup de la forme carrée. Les pièces de support sont très vigoureuses et très larges, et en projection horizontale, celles de la cuspide principale font souvent saillie en dehors du bord des plaques dentaires. La dent rachiale possède 3 cuspides bien développées, dont la principale est, comme d'ordinaire, considérablement plus grande que celles de côté. Vers le bord de la radule, les dimensions des plaques basilaires latérales se réduisent peu à peu, tandis que les cus

pides dentaires restent invariables. Le mésocone et l'ectocone sont seuls développés. Sur les cuspides principales la couche la plus superficielle, couche d'émail, dépasse un peu le bord de la plaque dentaire proprement dite, comme une fine bordure hyaline, étroite vers la pointe et plus large vers la base de la plaque. Cette bordure se voit dessinée sur les dents de la demi-rangée 38, mais a été supprimée sur la 39e; chez la plupart des auteurs elle n'a pas été remarquée. Sur les petites espèces des Maillots il n'a pas été possible de l'apercevoir, sauf chez quelques formes isolées où les cuspides étaient larges et relativement grandes. Les dents nos 7 et 8 forment, avec leurs plaques basilaires comparativement courtes, la transition aux dents marginales ayant des supports dentaires et des plaques basilaires rectangulaires, placées de travers. Pour ces dents, la cuspide principale continue à prédominer; elle est placée du côté intérieur et se distingue facilement des autres cuspides par sa grandeur. Les dents marginales intérieures n'ont que deux pointes latérales, et celles-ci étant presque de la même taille, il est assez difficile de déterminer laquelle est l'ectocone et laquelle la pointe accessoire. Les dents marginales extérieures portent plusieurs cuspides, généralement 4, mais dans certaines rangées transversales on a rencontré des dents à 6 ou 8 pointes; celles-ci ressemblent à de petits peignes.

La description et la figure ci-dessus données s'accordent bien avec les deux recherches antérieures faites par Gwatkin[21]), p. 227, fig. III, et par Soós[62]), p. 62 et 146, fig. 37. La seule différence visible est que l'exemplaire figuré par Soós présente 18 dents dans une demi-rangée, et par conséquent la dent 8 porte déjà trois cuspides. Les espèces de l'*Orcula* provenant du Caucase: *O. batumensis* Ret., p. 4, pl. 1, fig. 3, et *O. orientalis* Parr., p. 7, 8 (Hesse[30])), ressemblent tout à fait, par leurs formes, à l'*Orcula dolium*, le nombre de rangées est seul différent.

Lauria cylindracea Da Costa.

Fig. 29 du texte.

La radule se compose d'environ 110 rangées transversales, légèrement arquées, avec la formule dentaire: 19—1—19 ou 10—(2 + 7)—1—(7 + 2)—10.

Les plaques basilaires de la dent rachiale et des dents latérales sont carrées. Les pièces de support et les cuspides sont assez larges et vigoureuses. La dent rachiale porte 3 pointes, celle du milieu longue et en forme de lancette. Les dents latérales manquent d'entocone. Les dents 8 et 9 forment la transition aux dents marginales; la plaque basilaire tend ici à disparaître, et du côté extérieur du mésocone s'observent 2 cuspides; la dent 9 présente souvent même une saillie dentiforme sur le côté extérieur du sup-

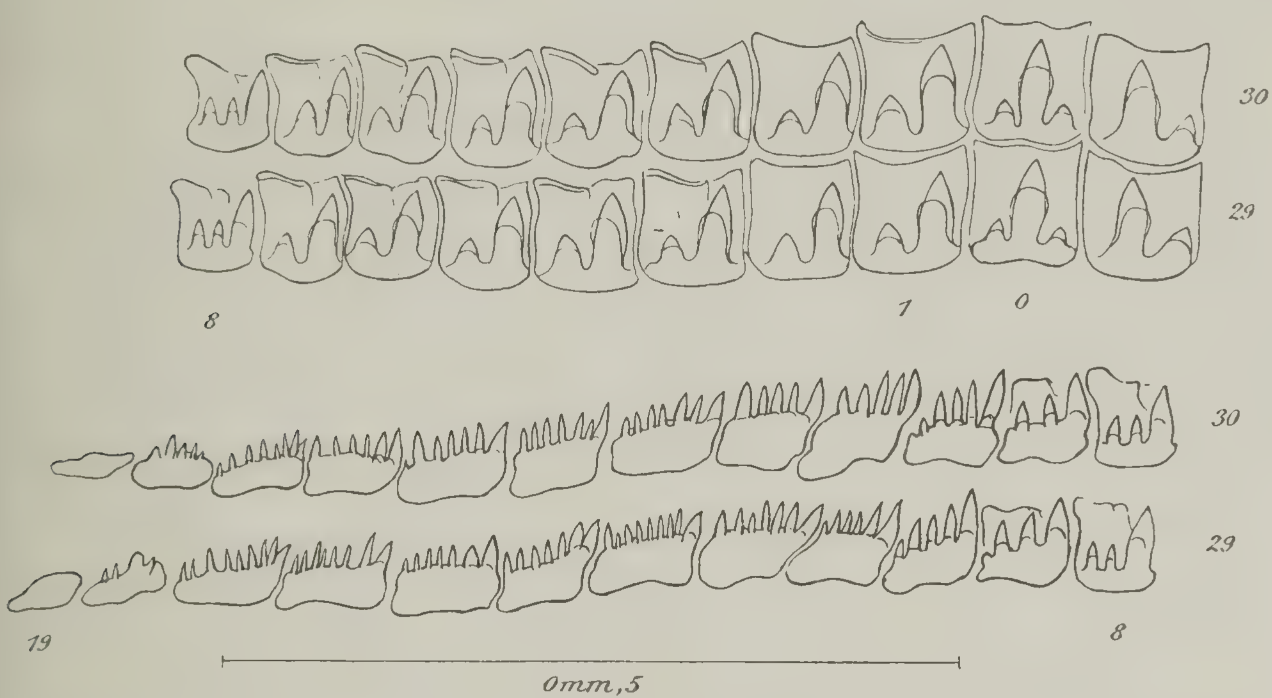


Fig. 29. Radule de *Lauria cylindracea* Da Costa. Moitié droite des rangées transversales 29 et 30. La demi-rangée est coupée à la 8e dent, et celle-ci dessinée dans les deux fragments. — *0*, dent rachinale; *1—9*, dents latérales; *10—19*, dents marginales.

port. Les dents marginales possèdent des plaques basilaires larges et basses et des supports dentaires à plusieurs pointes, depuis 5 jusqu'à 9; sur les dents intérieures, la cuspide principale est encore celle qui domine, sur les extérieures, toutes les pointes ont à peu près la même dimension; l'avant-dernière dent porte quelques pointes irrégulières, tandis que la plus externe est constituée par une plaque toute rudimentaire.

Les deux travaux de la littérature malacologique qui me sont connus, et où se trouve mentionnée cette radule, ne donnent pas beaucoup de renseignements sur la structure. Jickeli[32]), p. 114, indique que la radule du *Pupa umbilicata* (= *Lauria cylindracea*) présente en tout 33 rangées longitudinales (le *P. Bruguièrei* n'en a même que 27). Comme les individus danois étudiés possèdent 39 ran-

gées longitudinales, le nombre de dents, beaucoup inférieur, indiqué ci-dessus pour chaque rangée transversale, est assez frappant. Les indications de Lehmann[33]), p. 141, au contraire, s'accordent mieux avec les miennes; il compte 1 dent de plus dans chaque demi-rangée transversale (donc, en tout 41 rangées longitudinales), mais il constate beaucoup plus de rangées transversales, à savoir 150. La description des formes dentaires est en partie exacte, la figure, au contraire, pl. XIII, fig. 48, est très mal rendue.

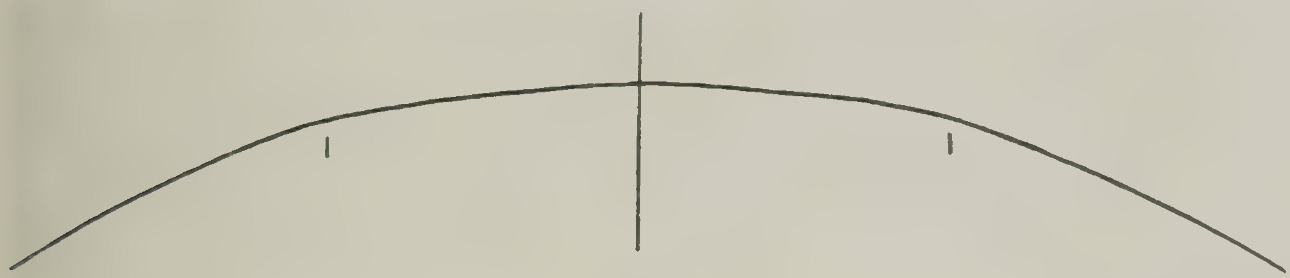
Pupilla muscorum L.

Fig. 30 et 31 du texte.

Pour ce qui concerne la structure des dents prises isolément, la radule de cette espèce ressemble étonnamment à celle du *Lauria cylindracea*, seulement le nombre de rangées longitudinales que renferment les différents groupes de dents, est moins élevé. Il existe, en tout, 83 rangées transversales, très légèrement arquées (fig. 30), avec la formule: 14—1—14 ou 7—(2 + 5)—1—(5 + 2)—7. Les plaques basilaires des dents rachiales et latérales sont carrées; la dent rachiale porte 3 fortes cuspides, les dents latérales, deux; les dents 6 et 7, ayant, outre le mésocone, deux pointes latérales, forment la transition aux dents marginales; la pointe extérieure de celles-ci étant la plus forte, il est à supposer que la nouvelle cuspide est placée entre le mésocone et l'ectocone. Ces dents présentent encore des traces de plaques basilaires carrées. Les dents marginales sont assez irrégulièrement garnies de cuspides, les intérieures de 3 à 5; les deux extérieures sont rudimentaires. Les plaques basilaires et les pièces de support des dents marginales sont rectangulaires et placées transversalement.

La description et la figure du *Pupilla badia* Ad. = *Pupilla muscorum* L., faites par Morse[42]), pl. 10, fig. 92, p. 37, correspondent à merveille avec mes observations. Il indique exactement le même nombre de dents pour chaque rangée transversale, dont il compte 90. Bien que sa figure soit très petite, elle rend pourtant d'une manière excellente les formes dentaires. La description de Lehmann[33]), p. 145, est assez bonne; il a constaté une dent de plus de chaque côté de la rangée transversale, et, comme Morse, il en a compté 90. Sa figure, pl. XIV, fig. 50, est de même assez réussie. Schacko[35]), p. 24, indique la formule: 98 × (8—5—1—5—8). Wieg-

mann[85]), p. 212, a donné le nombre et la mesure des dents radulaires chez les individus jeunes, et dans un travail antérieur[63]),



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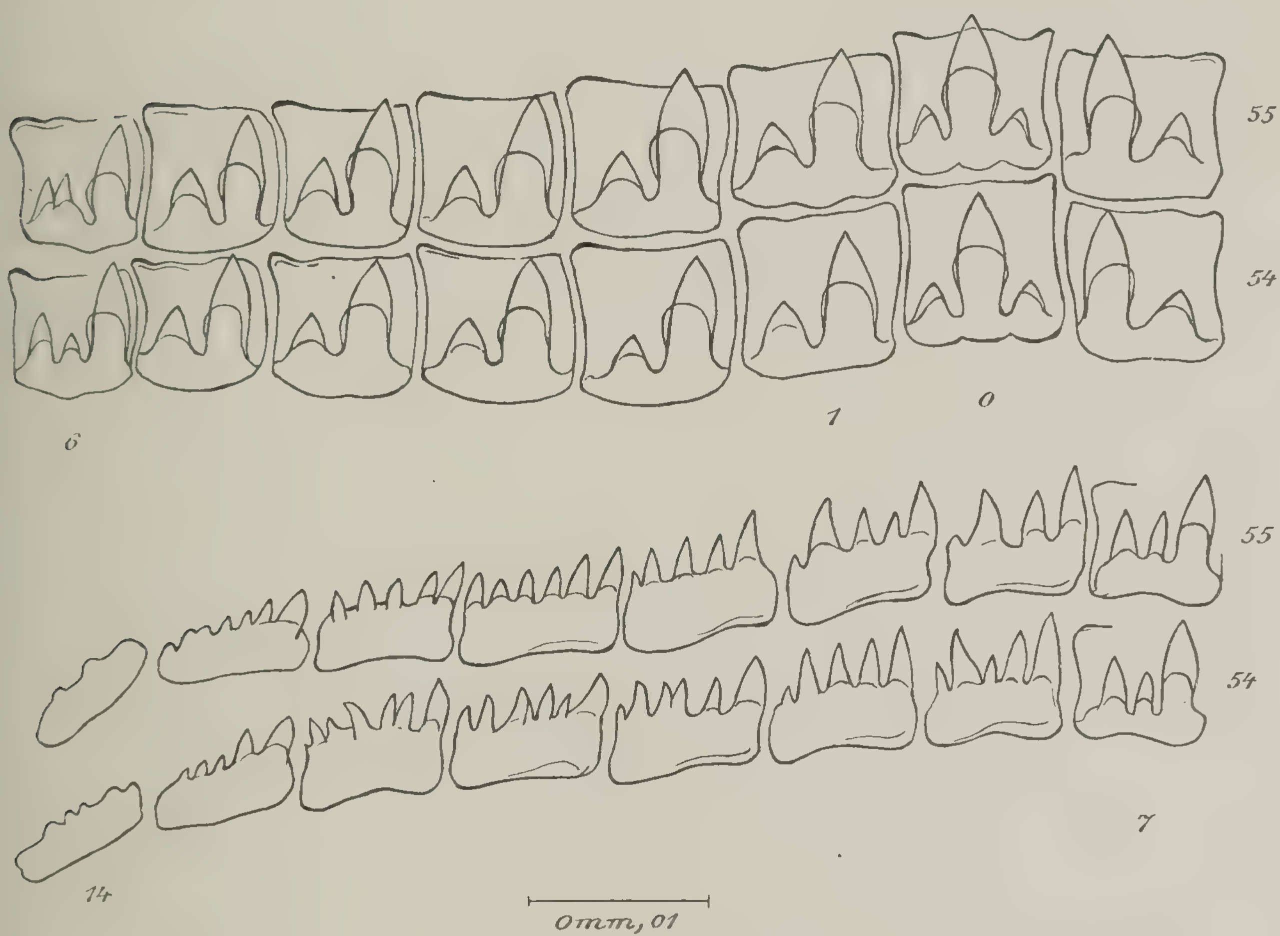

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Fig. 30 et 31. Radule de *Pupilla muscorum* L. — Fig. 30. Forme d'une rangée transversale. — Fig. 31. Moitié droite de deux rangées transversales, coupées entre les dents 6 et 7. — *0*, dent rachiale ; *1—7*, dents latérales ; *8—14*, dents marginales.

p. 172, fig. 143, l'auteur de la présente étude a décrit enfin la radule et a donné une figure de la dent rachiale et des 9 dents avoisinantes d'une rangée transversale.

Vertigo.

La radule varie beaucoup d'aspect chez les différentes espèces; dans la plupart elle est très particulière, et se distingue au premier coup d'œil de celle de tous les autres Pulmonés.

Il est vrai qu'il existe des points de ressemblance avec les *Truncatellina* et les *Columella*, mais ceux-ci ont d'ailleurs leur mode particulier de développement. Chez plusieurs espèces de *Vertigo* (et chez le *V. moulinsiana* de la manière la plus accentuée), les dents, semblables au trident de Neptune, ont 3 cuspides, entre lesquelles se constatent presque toujours des pointes accessoires.

Vertigo moulinsiana Dup.

Fig. 32 et 33 du texte.

Cette espèce possède 78—112 rangées transversales de dents disposées en forme d'arc d'arbalète élégant (fig. 32). La formule dentaire est: (19 à 20)—1—(19 à 20) ou 10—(9 à 10)—1—(9 à 10)—10, chez quelques exemplaires irlandais: (21 à 22)—1—(21 à 22).

Les plaques basilaires des dents rachiales et latérales sont à peu près carrées, celle de la rachiale est cependant un peu plus longue que large, et légèrement reculée par rapport à la première dent latérale. Le mésocone de la dent rachiale est allongé, en forme de lancette, les cuspides latérales sont bien développées et considérablement plus longues et plus pointues que d'ordinaire chez les Pulmonés; ce qui est cependant plus particulier, c'est qu'il s'observe de chaque côté, entre la cuspide latérale et la principale, une saillie toute fine; celle-ci produit l'impression d'être une légère protubérance du support dentaire, peut-être sans enveloppe d'émail; mais les dents étant toutes petites, et les pointes accessoires en question ne mesurant qu'un demi micron de largeur, il est impossible d'en constater les détails. Les trois cuspides des dents latérales sont relativement longues, celle du milieu un peu plus courte cependant que les deux autres. Il faut donc expliquer la première comme étant une cuspide accessoire, insérée entre les deux dernières, dont l'intérieure représente le mésocone, l'extérieure, l'ectocone. Ces deux sont très écartées, et divergent un peu vers les extrémités libres. Les cuspides présentent toutes trois des pièces de support bien développées, entre lesquelles se voient des pointes accessoires. Aux angles extérieur et intérieur du support commun se trouve quelquefois une courte pointe accessoire, mais d'un autre caractère. Les dents marginales sont construites comme les latérales, quant aux traits essentiels; les auteurs Tomlin et Bowell[76]),

p. 297—298, ont même nié qu'il y eût la moindre dissemblance. Par mes examens j'ai constaté toutefois la différence suivante: D'abord les dents latérales présentent de grandes plaques basilaires, carrées, tandis que les marginales ne possèdent que les supports

32

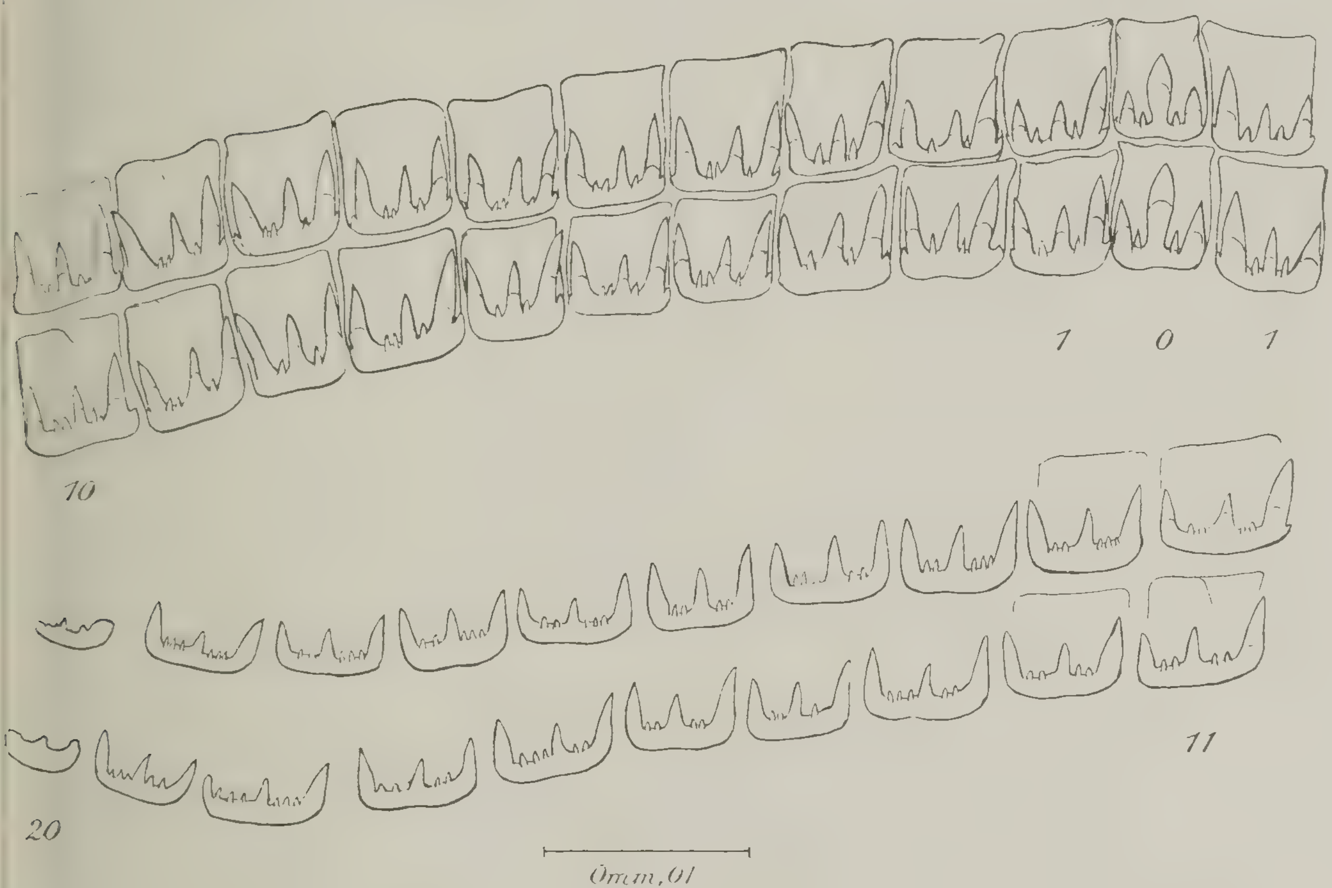

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Fig. 32 et 33. Radule de *Vertigo moulinsiana* Dup. — Fig. 32 montre la disposition des dents dans une rangée transversale. — Fig. 33. Moitié droite de deux rangées transversales. — *0*, dent rachiale; *1—10*, dents latérales; *11—20*, dents marginales.

dentaires, étroits et transversaux, puis il se constate toujours sur ces dernières dents, entre chaque cuspide principale, 2 ou 3 accessoires, donc, 4 ou 6 pointes accessoires sur chaque dent, tandis que les latérales n'en offrent que 2 ou 3 en tout. La dent extérieure est tout à fait rudimentaire.

Dans l'étude susmentionnée de Tomlin et Bowell[76]), p. 298, pl. 5, se trouve une excellente description de quelques dents appartenant à une demi-rangée transversale. Malheureusement on n'en

a figuré que six en tout; mais les auteurs indiquent que chaque demi-rangée comprend 25 dents, sans compter la rachiale. Chez les individus danois on n'en a remarqué que 19—20, chez les exemplaires d'Irlande, 21—22. Sur la même planche du travail de Tomlin et Bowell se trouvent également des figures de la radule de deux espèces apparentées, *V. lilljeborgi* Westld. et *V. ventricosa* Morse, qui n'est pas aussi irrégulière que chez le *V. moulinsiana* et se rapproche davantage du type normal des Pupillides (*Pupilla, Lauria, Orcula,* etc.); elle a de même un nombre plus restreint de dents dans chaque rangée transversale, respectivement 12—1—12 et 14—1—14.

Dans l'ancienne description de la radule du *V. moulinsiana* (indiqué sous le nom de *V. ventrosa* n. sp.), faite d'après des exemplaires recueillis en Allemagne, Heynemann[31]), p. 13, pl. I, fig. 8 a et b, donne, comme Tomlin et Bowell, la formule 25—1—25. Il n'a pas remarqué les fines cuspides accessoires, mais, à part cela, ses indications sont exactes. Lehmann[33]) a décrit et figuré la radule des espèces suivantes du *Vertigo*, provenant des pays scandinaves ou de l'Europe centrale: *Vertigo antivertigo*, p. 149, pl. 14, fig. 52, avec la formule dentaire: 110 × (14 à 15)—1—(14 à 15), *V. pygmæa*, p. 151, pl. 14, fig. 53, formule: 160 à 180 × (20—1—20), *V. pusilla(?)*, p. 153, pl. 14, fig. 54, formule: 125 × (24—1—24) et *V. angustior*, p. 154, pl. 14, fig. 55, avec la formule: 120 × (12—1—12). Les figures sont si mal dessinées qu'on ne pourra guère s'en servir. Pour ce qui concerne les espèces américaines du *Vertigo*, nous renvoyons à l'aperçu bibliographique donné dans l'introduction.

Saint-Simon[53]), p. 5—7 de l'extrait, a étudié 3 espèces du *Vertigo: V. pusilla,* dont la formule dentaire est: 40 × (8—6—1—6—8), *V. angustior,* formule: 56 × (6—10—1—10—6) et *V. antivertigo*, formule: 40 × (6—8—1—8—6). Malheureusement il ne se trouve pas de reproductions de la radule.

Nesopupa moreleti Brown.

Fig. 34 du texte.

Pour la 1^re^ et la 2^e^ rangée longitudinale des dents latérales, la radule de l'exemplaire examiné est sans doute anormale. Elle a été

néanmoins dessinée, vu que, d'après l'aspect des dents de la 3e rangée longitudinale, il est facile de reconstruire les deux autres, la différence entre les rangées longitudinales intérieures des dents latérales étant en général très peu importante.

L'individu possédait env. 102 rangées tranversales dont les dents étaient disposées suivant la formule: 11—1—11 ou 4—(1+6)—1—(6+1)—4. Les plaques basilaires rachiales et latérales sont carrées. La dent rachiale a 3 cuspides principales et 2 accessoires. Le mésocone est très long, de même que son support, et ce dernier est très élargi en arrière, de manière que ses bords dépassent

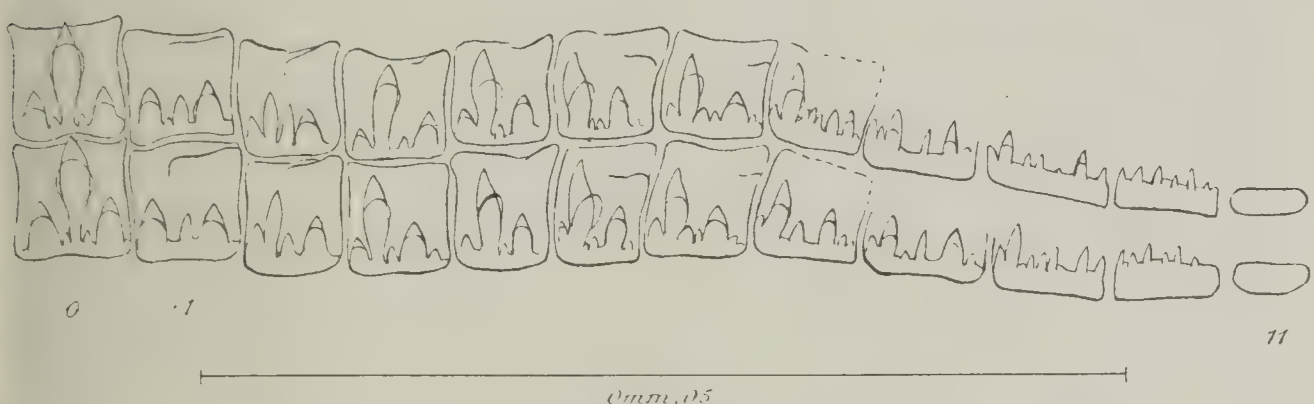

Fig. 34. Radule de *Nesopupa moreleti* Brown. Deux demi-rangées du côté gauche. Les dents latérales des rangées longitudinales 1 et 2 sont difformes. — *0*, dent rachiale; *1—7*, dents latérales; *8—11*, dents marginales.

la plaque dentaire en dessous jusqu'à une certaine distance des deux côtés. Les cuspides latérales et leurs supports sont relativement longs; les pointes accessoires assez distinctes sont placées entre le mésocone et les cuspides latérales. Comme il a déjà été indiqué, les rangées latérales 1 et 2 sont assez anormales, portant 3 à 4 pointes irrégulières. Dans les rangées 3 et 4, les dents présentent 3 cuspides principales: un mésocone, grand et irrégulier, et un ectocone large et fort, mais considérablement plus court; la cuspide intérieure est munie d'une pièce de support, et elle est d'ailleurs si vigoureuse qu'elle ne peut être prise pour une pointe accessoire, mais représente plutôt l'entocone. Entre le mésocone et l'ectocone s'aperçoit une forte cuspide accessoire, et une autre, tout à fait semblable, apparaît également dans quelques-unes des rangées transversales, du côté latéral de l'ectocone. Les rangées longitudinales 5 et 6 sont construites, pour l'essentiel, comme les deux précédentes, seulement il se constate deux cuspides accessoires entre le méso-

cone et l'ectocone, et il existe toujours des pointes accessoires du côté extérieur. La dent 7 forme la transition aux dents marginales; la plaque basilaire n'est nettement délimitée que vers l'intérieur, les cuspides principales sont devenues plus petites et plus étroites, tandis que quelques-unes des pointes accessoires ont grandi. Les rangées 8—11 manquent de plaques basilaires proprement dites; les supports dentaires sont longs et étroits, placés transversalement. La rangée extérieure, le n° 11, n'est que rudimentaire, sans cuspides, les 3 autres rangées (8—10) en ont 6—7; dans la 10^e rangée il n'est pas possible de déterminer quelles sont les cuspides principales et quelles sont les accessoires.

Les dents de cette espèce rappellent beaucoup celles du *Vertigo lilljeborgi*, figurées chez Tomlin et Bowell[76]), pl. 5, et elles semblent indiquer, ainsi que les organes génitaux, la parenté étroite qui existe entre les *Nesopupa* et les *Vertigo*.

Truncatellina cylindrica Fér.

Fig. 35 du texte.

Les radules de 4 exemplaires ont été étudiées, et se sont trouvées assez exactement conformes. Il se constate env. 90 rangées transversales, dont les dents sont disposées en forme d'arcs peu accentués; sur la région antérieure, active, qui était entièrement étendue, les rangées constituaient des lignes droites. La formule dentaire est: 13—1—13 ou 4—9—1—9—4. De véritables plaques basilaires ne sont développées, comme à l'ordinaire, que sur les dents rachiales et latérales; elles sont carrées, et sur les dents 8 et 9 elles ont à peu près disparu, en tout cas leurs limites se sont effacées. La dent rachiale a trois cuspides nettement distinctes, dont le mésocone est long, en forme de lancette, et les pointes latérales sont bien développées; les dents latérales portent deux cuspides, placées sur des supports dentaires bien développés, formant chacun une saillie arquée. Sur les dents intérieures (1—3), une petite différence s'observe quelquefois entre les deux cuspides, l'intérieure (le mésocone) étant un peu plus grande que l'extérieure (l'ectocone); mais sur les autres, elles sont absolument de la même dimension. Depuis la 3^e dent, il se trouve sur presque toutes les autres, entre les deux cuspides principales, une pointe accessoire

toute fine (formée du support dentaire); dans la 8e rangée longitudinale où ces cuspides s'écartent l'une de l'autre, on en voit en général deux. Quelquefois il existe aussi de petites saillies sur les bords extérieurs du support. Le numéro 9 est une dent de transition; des restes de la grande plaque basilaire, carrée, se remarquent encore, mais la pièce de support est basse, et les cuspides principales diminuent de hauteur. La première dent marginale véritable possède plusieurs cuspides, généralement 5 env. — le nombre n'en est cependant pas constant. Dans quelques-unes des rangées transversales on peut distinguer encore quelles sont les pointes correspondantes aux cuspides principales. Les 3 dents extérieures

Fig. 35. Radule de *Truncatellina cylindrica* Fér. Moitié droite des rangées transversales 29 et 30. — *0*, dent rachiale; *1—9*, dents latérales; *10—13*, dents marginales.

de chaque rangée transversale sont des plaques rudimentaires, placées de travers, le plus souvent sans le moindre signe de cuspides. La plaque extérieure est placée de biais, dirigée d'avant en arrière et vers le dehors.

Lehmann[33]), p. 139, pl. 13, fig. 47, a décrit la radule de cette espèce, mais sa description des formes dentaires n'est pas bonne, et la figure plutôt impossible à utiliser; il indique comme formule: 100 × (21—1—21), c'est-à-dire un nombre considérablement plus grand de dents latérales et marginales, que celui qui a été constaté par moi chez mes individus examinés. La formule qu'il donne (p. 147, pl. 14, fig. 51) pour le *T. costulata*: 80 × (10—1—10), s'accorde beaucoup mieux avec celle que j'ai constatée pour le *T. cylindrica*. On pourrait s'imaginer peut-être une erreur ou une observation inexacte de la part de Lehmann, supposition qui se

confirme par la circonstance que Saint-Simon,[53]) (*«Vertigo muscorum»*, p. 4 de l'extrait) indique de même un nombre beaucoup plus restreint pour les dents latérales et marginales, à savoir 70 ×(6—8—1—8—6). Malheureusement il n'existe pas de figure de cette espèce, et la description est courte et assez difficile à comprendre.*)

Columella edentula Drap.

Figure 36 et 37 du texte.

La radule est par sa structure étroitement apparentée avec celle des *Truncatellina.* Il existe en tout 130 rangées transversales de dents, avec la formule: 21—1—21 (dans un seul cas j'ai compté 22 dents de chaque côté) ou 3—(3+15)—1—(15+3)—3. Les plaques basilaires sont beaucoup plus longues que larges, et à mesure qu'elles se rapprochent du bord de la radule, elles diminuent de grandeur et se coupent en biais; mais c'est un fait particulier que ces plaques se voient souvent sur toutes les dents, excepté sur la rangée longitudinale extérieure, toute rudimentaire. Cette circonstance, ainsi que d'autres particularités, font que la limite entre les dents latérales et les marginales s'efface, et qu'en apparence les dernières font défaut. Les pointes sont, en général, assez courtes. La dent rachiale en porte 3; la principale est courte, les deux latérales le sont encore davantage. Les dents latérales ont 2 cuspides, le mésocone et l'ectocone, qui sont de la même taille. Entre ces deux se trouve, sur toutes ces dents, une fine pointe acces-

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*) Pendant que l'étude présente était sous presse, j'ai reçu un travail du Dr N. Odhner[46]) dans lequel il donne une figure excellente d'une demi-rangée transversale chez le *Truncatellina cylindrica* (fig. 7). Cette figure s'accorde très bien avec la mienne; il existe cependant cette différence que l'exemplaire étudié par Odhner présentait aussi des pointes accessoires sur les deux premières dents latérales, et qu'il possédait une dent marginale de moins. Dans la figure faite par moi, la rangée a été d'ailleurs vue un peu plus par devant que dans celle d'Odhner. Les trois figures des dents du *Truncatellina costulata* (fig. 6), *T. sundleri* (fig. 5) et *T. monodon* (fig. 8) sont très utiles pour établir une comparaison. Odhner y a montré que les deux premières espèces ressemblent beaucoup au *T. cylindrica*, tandis que le *T. monodon* occupe une place un peu à part, vu la différence considérable dans les dimensions du mésocone et de l'ectocone.

soire; sur les dents rachiales, au contraire, on n'a jamais constaté de cuspides accessoires. Dans la fig. 37 *A* du texte ont été reproduites deux dents provenant des 4e et 5e rangées longitudinales, vues absolument de face. Par ce mode d'observation les cuspides principales, ainsi que les accessoires, apparaissent plus longues. La fig.

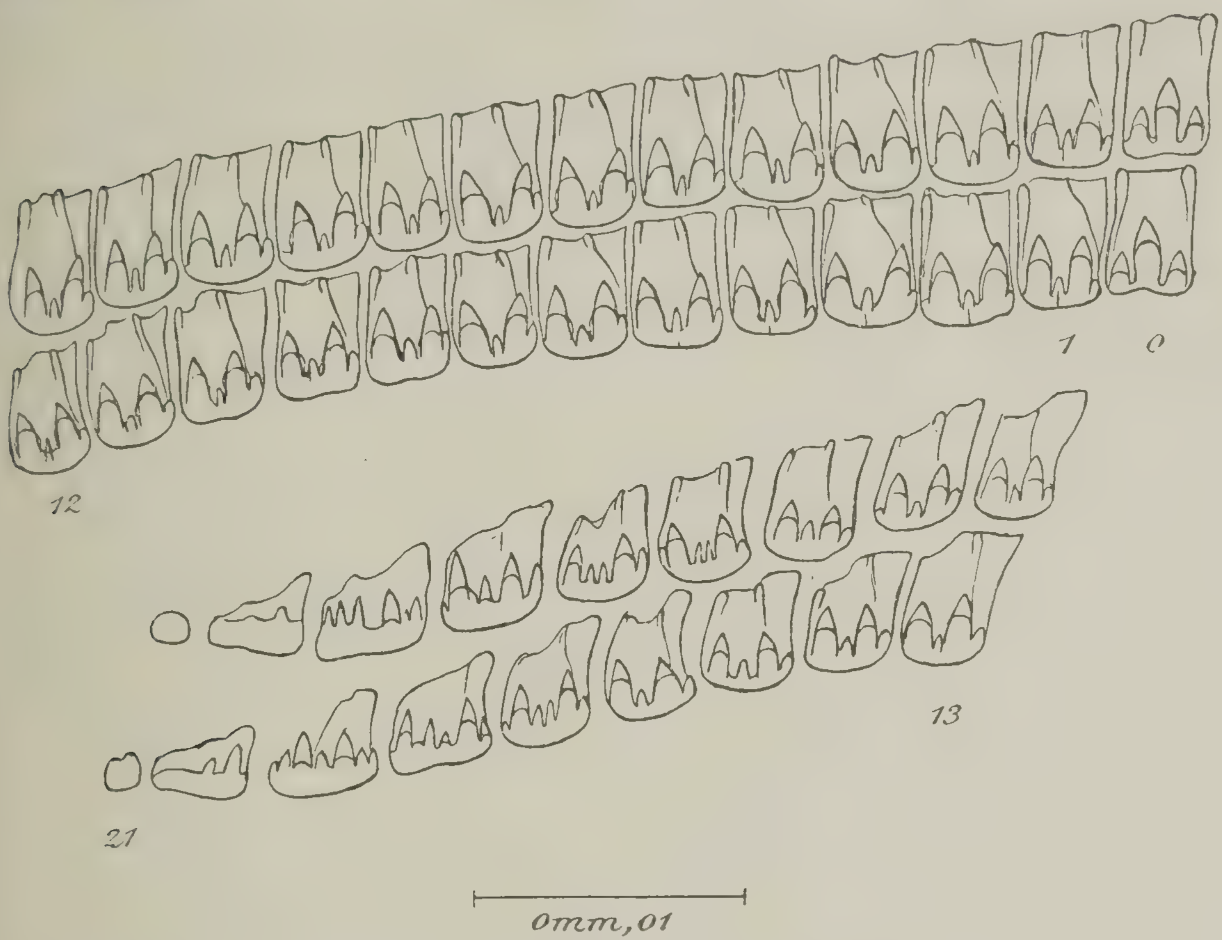

Fig. 36. Radule de *Columella edentula* Drap. Moitié droite de deux rangées transversales. — *0*, dent rachiale; *1—15 (18)*, dents latérales; *16 (19)—21*, dents marginales.

37 *B* montre des dents latérales, vues, l'une de côté, l'autre un peu obliquement d'en haut; elle donne une idée de la forme courte et courbée des cuspides. Sur les côtés extérieur et intérieur de la pièce de support des dents latérales se constatent assez souvent de courtes saillies dentiformes. Les dents 16 et 17 présentent souvent 2 pointes accessoires entre les cuspides principales; sur la dent 18 apparaît quelquefois encore une cuspide accessoire intérieure, de même que la plaque basilaire a été considérablement raccourcie. Les dents de la 19e rangée longitudinale sont les seules dents marginales d'un développement un peu régulier; elles portent plusieurs cuspides (5—7), mais il existe encore une partie de la véritable plaque basilaire; un reste de celle-ci s'observe également dans la 20e rangée longitudinale, où les pointes sont toutes rudimentaires.

La dent extérieure de chaque rangée transversale est une petite plaque dentaire, rudimentaire.

Lehmann[33]), p. 143, a décrit la radule du *Pupa edentula* Drap.; mais l'exposition et la figure, pl. 14, fig. 49, sont tout à fait erronées, et les indications sur les rangées longitudinales et transversales très peu claires. Il indique 149 rangées longitudinales et 25 transversales, mais un peu plus loin il parle de la 24e dent de la rangée transversale! La description de Sterki[68]), p. 75—76, au contraire, est excellente, elle correspond exactement aux radules examinées par moi. Selon lui la formule dentaire est la suivante: 116—127 × [(20) 21 —1—(20) 21]. Gwatkin[21]), p. 227, a donné une figure de la radule, qui, cependant, manque absolument de détails. W. Dall[22]) (p. 372, dans la note) a pu, comme moi, constater l'exactitude de l'examen de Sterki; mais il décrit les cuspides de la partie de la radule encore en fonction, comme étant de couleur noire, au lieu de couleur de corne claire, ce qui n'est pas le cas pour les individus danois étudiés, et, suivant Watson[81]), p. 280, pas davantage pour les anglais. Malheureusement je n'ai pu me procurer les recherches de Saint-Simon[54]).

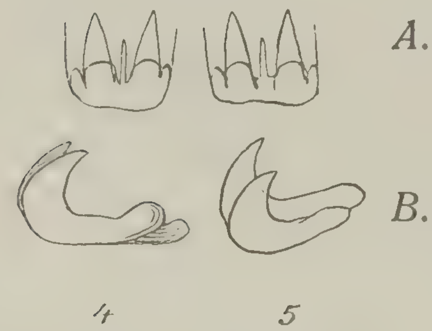

Fig. 37. — *A.* Deux dents de *Columella edentula* Drap., vues de face. — *B.* Deux dents vues de côté, l'une *(5)* également un peu d'en haut.

Acanthinula (Zoogenetes) harpa Say.

Figure 38 du texte.

La radule se compose de 72 rangées transversales; comme le montre la fig. 38 *A*, celles-ci sont droites dans la partie du milieu, arquées des deux côtés, de sorte que toute la rangée forme un arc d'arbalète. Formule: 16—1—16 ou 9—(2 + 5)—1—(5 + 2)—9. La dent rachiale est un peu reculée par rapport aux dents latérales avoisinantes. Sa plaque basilaire est un peu plus longue que large, et elle porte trois cuspides, dont le mésocone est vigoureux et en forme de lancette, tandis que les cuspides latérales sont courtes, mais larges. Les dents latérales ont des plaques basilaires carrées, les 5 intérieures présentent une cuspide extérieure, très forte (l'ectocone), et un grand mésocone, placé un peu obliquement, dont la

pièce de support fait saillie sur le côté de la plaque dentaire; les rangées 6 et 7 forment la transition aux dents marginales; elles possèdent encore des plaques basilaires bien distinctes, mais outre l'ectocone, se voit, dans la rangée 6, une cuspide accessoire du

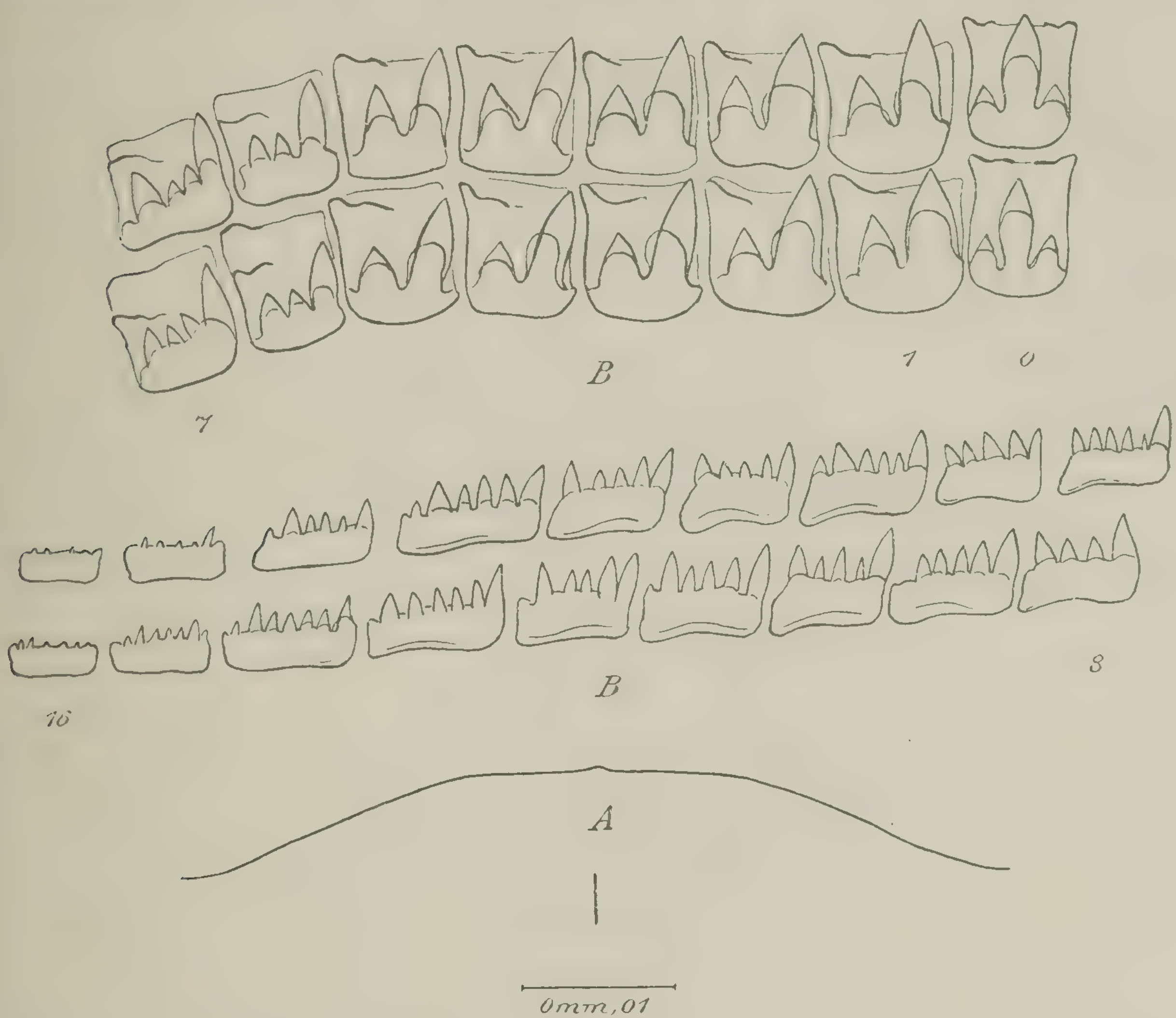

Fig. 38. Radule d'*Acanthinula (Zoogenetes) harpa* Say. — *A*. Disposition des dents d'une rangée transversale. — *B*. Moitié droite de deux rangées transversales. — *0*, dent rachiale; *1—5(7)*, dents latérales; *6(8)—16*, dents marginales.

côté latéral de la principale, et même deux dans la rangée 7; ces dents sont donc garnies respectivement de 3 et de 4 cuspides. Les dents marginales sont presque toutes semblables, sauf que les pointes diminuent de grandeur vers le bord. Les supports dentaires sont très larges, mais n'ont que peu d'étendue dans la direction d'avant en arrière. Le nombre des cuspides varie de 4 à 7. Le mésocone se distingue assez loin et souvent aussi l'ectocone des dents intérieures. Les dents des deux rangées extérieures portent des pointes rudimentaires.

La radule de l'*Acanthinula harpa* n'a été examinée antérieurement que par Morse[42]), p. 35, qui donne également une descrip-

tion de sa croissance; il la figure dans deux stades différents du développement: pl. I, fig. 11—12. La radule de l'adulte, p. 36, pl. I, fig. 10, est assez conforme à la fig. 38 de la présente étude. La formule en est: 120×(17—1—17).

La radule des autres espèces européennes de l'*Acanthinula: A. aculeata* et *A. lamellata,* a été décrite et figurée par Bowell[11]), p. 158—159. Selon Watson[80]), p. 11, l'*A. aculeata* présente la formule: 87 × (8—6—1—6—8), et l'*A. lamellata* celle de: 95 × (8—7—1—7—8). La description et les figures que Lehmann donne de ces deux espèces (*A. aculeata*: p. 96, pl. 11, fig. 32; *A. lamellata*: p. 81, pl. 10, fig. 25) ne sont pas bonnes; surtout pour la première, ses indications sont très peu claires; il indique pour les rangées longitudinales un nombre aussi élevé que 72, ce qui est absolument inexact (suivant Bowell et Watson c'est respectivement 33 et 29).

Vallonia.

Il existe déjà, dans la littérature malacologique, plusieurs bonnes études sur la radule de ce genre, et nous nous contenterons donc ici d'y référer. Dans l'introduction se trouve citée la littérature concernant les formes américaines; nous allons ajouter les espèces européennes examinées:

Vallonia pulchella Müll. — Watson[80]), p. 11—12, fig. 4*d*, donne la formule: 70×(9—4—1—4—9); sa figure est exactement conforme à celle de Sterki[67]), pl. VIII, fig. *A*, *G*. — Lehmann[33]), p. 91, indique, pour les rangées longitudinales, le même nombre, mais pour les transversales, le chiffre 60. Sa figure, pl. 11, fig. 30, est mal dessinée.

V. costata Müll. — Bowell[11]), figure, p. 158; formule (d'après Watson)[80]), p. 11: 70 × (9—5—1—5—9). La figure correspond très bien avec celle de Sterki[67]), pl. VIII, fig. C.

Adolf Schmidt[57]), p. 59, a décrit en quelques lignes la radule des espèces ci-dessus mentionnées.

V. excentrica Sterki. — Bowell[11]), figure, p. 158; Sterki[67]), pl. VIII *B*. Formule: 76×(9—4—1—4—9) (Watson[80]), p. 11).

V. cyclophorella Anc.—Sterki[67]), pl. VIII, fig. *E*; formule (p. 273): 63×(7—5—1—5—7). Une bonne exposition d'ensemble se trouve chez ce même auteur[67]), p. 239, 240.

Pyramidula rupestris Drap.

Parmi les travaux cités dans l'aperçu de la littérature malacologique et qui traitent de la radule de cette espèce, ceux de Bowel[10]), p. 290 (figure), et de Wiegmann[26]), p. 112—114, sont les meilleurs. Watson[80]), p. 12, fig. 4*a*, a figuré la radule d'un embryon, et dans la même étude il indique pour l'adulte la formule dentaire suivante: 145 × (11—6—1—6—10); chez Wiegmann (Hesse) cette formule est: 90 à 117×(17—1—17); chez Bowell: 173 à 204×(11—7 à 8—1—7 à 8—11).

Patulastra balmei P. et M.

a été examiné par Watson[80]), p. 12, fig. 4*b* et *c*; la première figure représente la radule d'un embryon, la dernière celle d'un adulte. Formule: 125×(17—9—1—9—17).

Aspasita triaria Rossm.

Chez Soós[62]), fig. 40, p. 66 et 147, se trouve une bonne figure et description de cette espèce. La formule est, pour une seule rangée transversale: (10 à 13)—6—1—6—(10 à 13).

Strobilops Pilsbry (= *Strobila* Morse).

Morse[42]), p. 27, donne une description et une figure (pl. 8, fig. 68) du *S. labyrinthica* Say. Binney[4]) décrit et figure la même espèce (vol. V, p. 258—259, planche V, fig. *O*), ainsi que *S. hubbardi* Brown (ibidem, p. 259, planche V, fig. *N*). La formule dentaire est pour la première espèce: 78 × (8—5—1—5—8), pour la dernière: 9—5—1—5—9.

Mâchoire.

Chondrina similis Brug.

Pl. V, fig. 2.

La mâchoire de cette espèce a la forme d'un croissant, plus développée au milieu, où se trouve, dans le bord libre, une saillie large mais basse; cette dernière n'est cependant pas également accentuée chez tous les exemplaires; les extrémités sont de même

un peu élargies, et à l'endroit où elles se continuent dans la région principale de la mâchoire, se voit, également dans le bord libre, une entaille bien marquée. Examinée à un faible grossissement, la mâchoire est d'aspect assez uniforme, lisse; à l'aide d'un grossissement plus fort, on remarque cependant deux systèmes de lignes qui s'entrecroisent. Sur toute la surface de la mâchoire s'aperçoivent de fines lignes parallèles au bord convexe; une ligne plus accentuée marque le bord supérieur de la région maxillaire postérieure. Le second système se compose de lignes un peu plus distinctes, et finement crispées, qui, dans le milieu de la mâchoire, sont perpendiculaires au bord libre. Comme elles sont toujours tracées parallèlement, l'angle qu'elles forment avec ce bord, ne reste pas tout à fait droit vers les extrémités. Etudiées à l'aide d'un très fort grossissement, les parties comprises entre ces lignes fines ont plutôt le caractère de côtes extrêmement étroites, séparées par des lignes claires. Le bord tranchant est un peu irrégulier dans la légère saillie médiane et le long des régions extérieures de la mâchoire; à part ces endroits, il est uni. La mâchoire de l'espèce en question a été antérieurement figurée chez Moquin-Tandon[41]), pl. 25, fig. 16, et décrite par Wiegmann[87]), p. 12.

Abida secale Drap.

Pl. V, fig. 3.

La mâchoire est analogue à celle de l'espèce précédente, mais un peu plus courbée; la saillie médiane est toute petite ou fait complètement défaut. Les extrémités sont larges et arrondies.

Sandahlia cylindrica Mich.

Pl. IV, fig. 3.

La mâchoire est d'une forme élégante, régulièrement arquée, plus haute dans le milieu, et s'atténuant peu à peu vers les deux extrémités. Chez cette espèce, nous constatons aussi, comme chez le *Chondrina similis,* une saillie médiane dans le bord libre, mais elle est moins longue, et le bord tranchant est, dans cette partie, comme dans tout le reste de son étendue, absolument uni. Les deux mêmes systèmes de lignes s'aperçoivent ici comme chez le *Chondrina similis.*

Orcula dolium Drap.

Pl. VI, fig. 3.

La mâchoire est du même type que celle des espèces précédentes, étant couverte de lignes parallèles très fines et très serrées, qui, dans la région du milieu, sont perpendiculaires au bord. Elle est demi-circulaire, de la même hauteur partout, et d'une structure extrêmement vigoureuse. Le bord libre est finement ondulé, sans saillie médiane, ou n'en possédant qu'une très faible. La mâchoire des espèces *O. batumensis* Ret. et *O. orientalis* Parr. a été décrite par Wiegmann-Hesse[30]) (p. 3 et 7 respectivement), qui a de même figuré celle de la première espèce (pl. I, fig. 2).

Lauria cylindracea Da Costa.

Pl. XX, fig. 2.

La mâchoire ressemble beaucoup à celle du genre *Pupilla*. Elle est courbée en forme de croissant, à bord uni et souvent à saillie médiane légère. Perpendiculairement sur le bord s'observent 16—17 raies claires, bien accentuées, lesquelles indiquent une composition formée de plaques, mais celles-ci sont beaucoup moins prononcées que chez les *Pupilla*, comme si la fusion était plus complète. Chez un des individus, quelques-unes des raies claires étaient plus larges que d'ordinaire, et à cet endroit la mâchoire rappelait un peu, par son aspect, celle du genre *Vertigo*.

Il existe plusieurs descriptions et figures de la mâchoire de cette espèce: chez Moquin-Tandon[41]), pl. 27, fig. 42; Lehmann[33]), p. 141, pl. 13, fig. 48; Jickeli[32]), p. 114, et J. W. Taylor[74]), vol. I, p. 255, fig. 510.

Pupilla muscorum L.

Pl. VI, fig. 4; pl. XIII, fig. 5.

Il existe une figure de la mâchoire de cette espèce, faite par l'auteur de la présente étude (Danmarks Fauna, 10, fig. 142; reproduite ici pl. XIII, fig. 5), et qui représente la forme la plus ordinaire. Celle-ci est courbée en croissant et à peu près de la même hauteur partout; les extrémités sont arrondies, et au milieu du bord tranchant se voit une saillie légère. Examinée au microscope à lumière transmise elle montre nettement quelques lignes

finement frisées, tracées perpendiculairement aux bords de la mâchoire. Leur nombre est de 15 à 20. Ces lignes indiquent les bords des plaques rectangulaires dont se compose la mâchoire; celles-ci ne sont pas libres mais soudées l'une à l'autre. Que ce soient vraiment des plaques soudées, c'est ce que montrent les mâchoires irrégulièrement construites, comme celle qui se trouve reproduite dans la fig. 4, pl. VI; quelques-unes des plaques sont, en effet, coupées en biais, petites et enfoncées comme des coins entre les autres. En arrière, les plaques forment quelquefois des saillies irrégulières, mais dans le bord libre, elles s'adaptent exactement l'une à l'autre, de manière à former une ligne absolument égale.

Descriptions et figures antérieures: Morse[42]), p. 37, fig. 91; Wiegmann[85]), p. 232; Moquin-Tandon[41]), p. 393; Lehmann[33]), p. 145, pl. 14, fig. 50.

Vertigo.

La mâchoire présente ici une forme très caractéristique, étant composée de larges plaques presque rectangulaires, avec des espaces intermédiaires plus minces, ou plutôt on pourrait la décrire comme une mâchoire en forme de fer à cheval, avec un petit nombre de côtes très larges et légèrement voûtées, ou presque plates, plus épaisses et plus sombres que les sillons étroits et clairs qui les séparent.

Vertigo antivertigo Drap.

Pl. XXX, fig. 2.

Chez cette espèce la mâchoire est, dans sa position naturelle, fortement courbée, presque en forme de fer à cheval, et présente à peu près partout la même largeur assez considérable; au milieu du bord tranchant s'observe une saillie légèrement arquée. Le bord maxillaire est uni, et les côtes ne font pas saillie. Sur la face antérieure se constatent 15 à 16 larges côtes, plus sombres, séparées par 14—15 sillons clairs, qui sont étroits mais à double contour nettement dessiné; la plaque postérieure, plus courte, de la mâchoire en forme de V, se distingue à travers l'antérieure. Dans la moitié inférieure apparaît un dessin de fines lignes con-

centriques, de même que les côtes portent de minces raies longitudinales.

Descriptions et figures antérieures: Moquin-Tandon[41]), p. 407; Lehmann[33]), p. 149, pl. 14, fig. 52, et Saint-Simon[54]), p. 6 de l'extrait; parmi celles-ci, la dernière est la meilleure.

Vertigo moulinsiana Dup.

La mâchoire présente à peu près le même nombre de côtes sombres (15—16), séparées par 14—15 raies claires. Elle ne semble pas aussi courbée que la précédente, cependant cette circonstance peut être due en partie à la préparation.

Vertigo pusilla Müll.

Pl. XX, fig. 3.

La mâchoire de cette espèce s'élargit vers les extrémités; chez les individus examinés on ne constatait que 12 larges côtes, séparées par 11 sillons clairs. Les côtes apparaissent nettement striées à l'aide de fines lignes serrées et bien accentuées; il se constate en outre quelques lignes transversales, parallèles aux contours de la mâchoire. Contrairement à ce qui se remarque chez le *V. antivertigo,* la saillie médiane fait ici défaut, mais en revanche les côtes sont considérablement saillantes dans le bord libre tranchant.

Descriptions et figures antérieures: Moquin-Tandon[41]), p. 410; Lehmann[33]), p. 153, pl. 14, fig. 54, et Saint-Simon[53]), p. 5 de l'extrait. La dernière de ces descriptions, qui est la plus détaillée, ne s'accorde pas avec les observations faites par moi. Dans l'ouvrage susmentionné de Saint-Simon se trouve décrit de même la mâchoire du *V. angustior.*

Nesopupa moreleti Brown.

Pl. XXI, fig. 3.

La mâchoire se rapproche de très près du type caractéristique du *Vertigo.* Elle est courbée et en forme de croissant, avec 16—18 larges côtes, sombres et toutes plates, séparées par d'étroits espaces intermédiaires, de couleur claire; 15 de ceux-ci sont nettement visibles. Le bord tranchant est un peu irrégulier, en partie parce que les côtes font légèrement saillie, et en partie parce que ces régions

saillantes sont irrégulièrement ondulées et dentées en scie. Il n'existe pas de saillie médiane.

Truncatellina cylindrica Fér.

Pl. XXV, fig. 3.

La structure de la mâchoire rappelle beaucoup celle du *Columella edentula*. Elle est arquée, en forme de croissant et pas très haute, aux extrémités arrondies, qui, chez quelques exemplaires, sont encore un peu élargies. Le bord supérieur offre de gracieuses sinuosités ou se découpe en languettes; le bord libre est entier ou quelquefois très finement et irrégulièrement dentelé. Il se constate, au nombre de 17—24, de minces lignes radiaires, bien accentuées et de couleur claire; nous avons donc ici une construction de plaques étroites, soudées l'une à l'autre. Toutes celles ci, excepté les plus latérales, se continuent jusque sur le bord supérieur (bord postérieur) dont le contour a été, par là, découpé en languettes. De nombreuses lignes concentriques, très fines, s'observent, surtout dans la région inférieure.

Des recherches antérieures au sujet du *T. cylindrica* ont été entreprises par: Moquin-Tandon[41]), p. 400, pl. 28, fig. 20; Lehmann[33]), p. 139, pl. 13, fig. 47; Saint-Simon[53]), p. 4 de l'extrait; Wiegmann[85]), p. 232, mesures pour la mâchoire. Un examen du *T. costulata*, étroitement apparenté à l'espèce dont nous parlons, se trouve chez Lehmann[33]), p. 147, pl. 14, fig. 51.*)

Columella edentula Drap.

Pl. XXV, fig. 2.

La mâchoire est courbée en croissant et d'une hauteur peu considérable. Elle se compose d'une région moyenne, de la même hauteur partout, et sans saillie médiane, et de deux extrémités arrondies, qui, dans le bord libre, sont nettement séparées de la partie du milieu, quelquefois par une petite entaille, comme chez le *Chondrina similis*. Sur la face antérieure se voient environ 20

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*) L'espèce apparentée *T. sundleri* Odhner[46]) (p. 3, fig. 4) possède une mâchoire qui ressemble beaucoup à celle du *T. cylindrica*, décrite ci-dessus; elle présente 19—20 lignes claires, perpendiculaires sur le bord tranchant.

raies verticales et finement ondulées; examinées à un fort grossissement, elles semblent constituer les limites d'un nombre équivalent de plaques étroites, qui s'avancent en forme de languettes le long du bord supérieur de la mâchoire, tandis que, sur le bord tranchant, elles se dessinent plus irrégulièrement, et donnent à celui-ci un aspect finement denté en scie. Ces plaques étroites dont se compose la mâchoire, ne sont pas libres mais solidement jointes l'une à l'autre, de manière à former une seule masse. De fines lignes concentriques s'observent dans toute l'étendue de la mâchoire. Une assez grande différence se remarque entre celle-ci et celle du *Vertigo*, où le nombre des côtes est moins élevé, et ces dernières, par conséquent, sont considérablement plus larges et séparées par des espaces intermédiaires clairs, à double contour net, ce qui n'existe pas ici. Par contre, la ressemblance avec la mâchoire du *Truncatellina* est très grande.

La mâchoire a été décrite par Moquin-Tandon[41]), p. 402 (sous le nom de *Vertigo edentula* Drap.), par Lehmann[33]), p. 143, pl. 14, fig. 49, et par Sterki[68]), p. 76. Dans le dernier travail l'auteur avance qu'elle est construite comme chez le *Punctum pygmæum*: «being quite low and composed of distinct plates». Quant à ces dernières paroles, il faut cependant faire remarquer que les plaques sont, en tout cas, soudées l'une à l'autre et étroitement jointes, de manière à former un ensemble.

Acanthinula (Zoogenetes) harpa Say.
Pl. XXI, fig. 4.

La mâchoire vigoureuse ressemble beaucoup à celle de l'espèce précédente, seulement elle est plus haute et composée de plaques plus larges mais moins nombreuses; celles-ci sont finement striées ou sillonnées dans le sens de la longueur, et toute la mâchoire est de plus couverte de stries concentriques, bien accentuées dans la moitié inférieure, toutes fines dans la supérieure. Chacune des plaques s'avance en forme d'arc sur le bord libre, qui est, en outre, légèrement dentelé dans la région moyenne de la mâchoire, où celle-ci est le plus usée. La plaque postérieure est fortement développée; elle se continue, comme à l'ordinaire, dans l'épaisse cuticule buccale, qui après la préparation reste souvent collée à la lame.

La mâchoire a été décrite et figurée par Morse[42]), p. 35—36; pl. I, fig. 13.

Les autres espèces de l'*Acanthinula* se trouvent décrites et figurées chez Lehmann[33]): *A. aculeata* Müll., p. 95, pl. 11, fig. 32, et *A. lamellata* Jeffr., p. 81, pl. 10, fig. 25.

Vallonia.

Chez Watson[80]), pl. I, fig. 6, se voit une bonne reproduction de la mâchoire du *Vallonia excentrica*, et chez Sterki[67]), pl. VIII, fig. *H*, *I*, *K*, *L*, d'excellentes figures de celle du *V. pulchella*, vue de face, de côté et en section. Le dernier auteur donne en outre une description détaillée de la mâchoire du genre dont nous parlons (p. 237), et des figures appartenant aux espèces suivantes: *V. excentrica*, pl. VIII, fig. *M*; *V. costata*, fig. *N*; *V. albula*, fig. *O*, et *V. parvula*, fig. *R*. Les descriptions et les figures plus anciennes sont: la mâchoire du *V. pulchella* chez Moquin-Tandon[41]), p. 141, pl. XI, fig. 28, chez Lehmann[33]), p. 91, pl. 11, fig. 30 et chez J. W. Taylor[74]), vol. I, p. 254, fig. 507 et 508.

Pyramidula rupestris Drap.

Des descriptions et des figures de la mâchoire de cette espèce se trouvent chez: Moquin-Tandon[41]), pl. XV, fig. 10; Pollonera[52]), pl. IV, fig. 14; Taylor[74]), vol. 3, p. 171, fig. 226; Hesse[26]), p. 111—112, fig. *A* (copie d'après Pollonera). Parmi ces expositions les trois dernières sont les meilleures.

Patulastra balmei P. et M.

Figure de la mâchoire chez Watson[80]), pl. I, fig. 5.

Aspasita triaria Rm.

Malheureusement Soós, qui d'ailleurs a traité de l'anatomie de cette espèce, n'en a ni décrit ni figuré la mâchoire.

Strobilops Pilsbry
(= *Strobila* Morse).

Quant à ce genre, l'espèce *S. labyrinthica* Say a été examinée tant par Morse[42]), p. 27, fig. 67, que par Binney[4]), vol. V, p. 258,

fig. 150; la figure de ce dernier paraît de beaucoup la meilleure. La mâchoire du *S. hubbardi* Brown a été décrite par Binney, l. c., p. 259.

Système nerveux.*)

Chondrina similis Brug.

Pl. XXXII.

Le système nerveux central présente, pour un Pulmoné, très peu de concentration: Tous les ganglions sont bien séparés et reliés par des connectifs et des commissures très distincts. Les *ganglions cérébroïdes (gc)* sont les plus grands; ils sont ovales et un peu aplatis. Leur face supérieure est tournée un peu en dehors, et le bord médial, résultant de l'aplatissement, un peu obliquement vers le haut, de sorte que les ganglions, vus par dessus, n'apparaissent pas dans leur plus grande étendue. Ils sont à la surface couverts d'un pigment brun jaune, plus rarement noir; celui-ci se continue assez loin sur les nerfs de l'ommatophore. Il existe deux commissures cérébrales; la longueur de la supérieure est égale à la largeur des ganglions cérébroïdes eux-mêmes; ou bien, chez quelques individus, un peu plus grande ou un peu moindre. La commissure est en général de couleur claire, toutefois elle présente au milieu, en arrière, une légère pigmentation disposée en taches. La commissure cérébrale inférieure (commissure sub-cérébrale), qui passe par-dessous la partie antérieure du tube digestif, est depuis longtemps connue chez les Gastéropodes, non seulement chez les Prosobranches et les Opisthobranches, mais aussi chez plusieurs Pulmonés. Cependant, des renseignements positifs faisaient défaut pour le groupe des *Orthurethra*; mais Watson[82]), p. 282 et 283, a donné maintenant 3 exemples provenant de ce groupe, entre autres du *Chondrina similis*. Chez les spécimens examinés par moi, cette commissure extrêmement fine s'étend des deux côtés entre l'artère céphalique latérale et le connectif cérébro-pédieux, pour se rencontrer du côté ventral sous l'œsophage. Les *ganglions pédieux*, obovals *(gp)*, ne le cèdent guère aux cérébroïdes

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*) Nomenclature d'après Schmalz[55]).

pour ce qui concerne les dimensions; quand on les éloigne un peu l'un de l'autre, on aperçoit deux commissures, l'une supérieure, l'autre inférieure, qui relient les ganglions entre eux. Sur la face dorsale, un peu en avant du milieu, se constate, sur chacun d'eux, une partie claire, ayant la forme d'un verre de montre, bombée et entourée par un cercle de pigment; c'est l'otocyste ou organe statique, contenant de nombreuses otoconies. A part cet organe, les ganglions pédieux sont blancs, ce qui est également la couleur de tout le reste du système nerveux, à quelques exceptions près mentionnées plus haut.

Les connectifs cérébro-pédieux ainsi que cérébro-pleuraux *(ccp)* sont longs et vigoureux, surtout les premiers. Les *ganglions pleuraux* (g. palléaux chez Bouvier; *gpl)* n'ont que des dimensions assez réduites; ils sont petits, triangulaires, et apparaissent, à un examen superficiel, comme des épaississements d'un des côtés des longs connectifs allant des ganglions cérébroïdes aux *ganglions pariétaux* (g. intestinaux chez Bouvier, g. palléaux chez Simroth, *gpa* et gpa_1). Les cordons pleuro-pédieux, partant de la pointe libre du triangle que forment les ganglions pleuraux, ont un parcours transversal; ils sont assez longs et vigoureux et constituent, avec les deux connectifs venant des ganglions cérébroïdes, un triangle à peu près équilatéral. Le cordon viscéral porte trois ganglions bien distincts; l'un, assez petit: le ganglion pariétal gauche, qui est à peu près globulaire *(gpa)*; un autre, considérablement plus grand, en forme d'amande: le ganglion pariétal droit (gpa_1), et enfin, serré contre ce dernier, un grand ganglion réniforme: le *ganglion viscéral* (g. abdominal chez Simroth, *gv*). Les connectifs pariéto-viscéraux sont petits, surtout celui du côté droit; les connectifs pleuro-pariétaux, au contraire, sont assez longs, principalement celui de droite.

Des ganglions cérébroïdes partent les paires de nerfs suivantes:

1⁰ Le *nerf olfactif* (nerf tentaculaire, *1*) part du milieu du ganglion, près du bord antérieur. C'est le plus vigoureux de tous les nerfs cérébroïdes. Il est accompagné de plusieurs vaisseaux et du:

2⁰ *Nerf optique (2)* très fin; dans leur région distale les deux nerfs sont enveloppés par le rétracteur de l'ommatophore. Le rapport entre les nerfs et le rétracteur est le suivant (du côté gauche): Une fine partie conjonctive et musculaire, ayant la forme d'un triangle, se détache du dernier *(ro)* et court au-devant des deux

nerfs. Dans le trajet vers la base de l'ommatophore, il se produit ensuite dans le rétracteur une fente où se logent ceux-ci; un peu avant d'atteindre la base mentionnée, le muscle se ferme et les entoure comme d'une gaîne, et ils se prolongent ainsi à travers toute la longueur de l'ommatophore *(om)*. Du côté droit, où le rétracteur et les nerfs passent entre le pénis et le vagin et où le premier se rattache fortement au pénis, les bandes — de tissu conjonctif avec quelques fibres musculaires — qui enveloppent tout l'ensemble, sont plus richement développées. Dans la figure, la musculature et le tissu conjonctif ont été écartés du côté droit, de sorte que seuls les nerfs restent.

3⁰ Le *nerf péritentaculaire externe (3)* et

4⁰ le *nerf cutanéo-céphalique (4)* naissent au côté antérieur et extérieur des ganglions cérébroïdes. Enveloppés de tissu conjonctif ils se dirigent vers la base du grand tentacule, parallèlement à un fort vaisseau situé du côté médial. A une certaine distance de celle-ci — et même chez quelques exemplaires à une distance assez longue (voir le côté droit de la figure) — le nerf cutanéo-céphalique abandonne l'autre, se courbe en dedans et en avant et innerve la peau comprise entre l'ommatophore, le petit tentacule et l'orifice génital.

Le nerf péritentaculaire externe *(3)* se divise en deux ramifications vigoureuses, dont l'une va au côté extérieur, l'autre au côté interne de la base de l'ommatophore et à son intérieur. Comme il n'a pas été possible, malgré des recherches minutieuses, de trouver un nerf péritentaculaire interne, il est à supposer que le péritentaculaire externe remplit également les fonctions de l'interne, ou que les filaments de ce dernier se réunissent avec ceux du nerf péritentaculaire externe et suivent le même chemin; la première hypothèse est la plus vraisemblable. Chez l'*Helix pomatia*, le nerf péritentaculaire interne est, suivant Schmalz[55]), celui de tous les nerfs qui est placé le plus haut, et dont le point d'origine est isolé; si cela était le cas pour le genre dont nous nous occupons ici, on n'aurait pas manqué de le remarquer.

5⁰ Le *nerf labial interne (5)* est situé très en haut; c'est le plus fin de tous les nerfs, à la seule exception du nerf optique; il prend naissance en avant, sur la face supérieure du ganglion cérébroïde, et aboutit directement à la peau comprise entre la mâchoire et le

petit tentacule. En atteignant la peau céphalique, il se divise en deux ramifications horizontales, dont l'une suit la peau du côté médial, passe par-dessus la mâchoire et s'enfonce entre les muscles courts qui vont de la peau céphalique au pharynx, tandis que l'autre ramification se dirige, latéralement, vers l'ommatophore, et innerve la peau du côté interne de celui-ci. Cette dernière ramification remplit donc en partie la fonction du nerf péritentaculaire interne, qui fait défaut.

6⁰ Le *nerf labial externe (6)* est un nerf assez vigoureux qui part du bord inférieur et antérieur du ganglion cérébroïde. Il se porte en avant, en bas, et en dedans sous le pharynx, en décrivant un arc, mais sans émettre aucune ramification. Tout à fait en avant il se bifurque; l'une des deux branches passe sous les muscles qui, sur la face inférieure du pharynx, relient celui-ci au plancher de la cavité du corps, l'autre se rend aux lèvres.

7⁰ Le *nerf labial médian (7)* frappe tout de suite les yeux par sa grosseur; il est de beaucoup le plus fort de tous les nerfs labiaux. Il a son point de départ sur le bord antérieur du ganglion cérébroïde et se dirige directement en avant vers les lèvres et le petit tentacule. Il envoie d'abord une branche à ce dernier; celle-ci, de même que le muscle rétracteur du petit tentacule *(rpt)*, est, pour ce qui concerne la structure et le trajet, une copie en réduction de ceux de l'ommatophore. Ici, le muscle est de même fendu et entoure le nerf comme une gaîne. Le petit tentacule étant court, le ganglion se distingue nettement à travers la fente de cette gaîne musculaire. Le reste du nerf labial médian se divise au même point en 3 ramifications, qui viennent s'épanouir dans la lèvre. Ces branches se ramifient, en atteignant la peau, en plusieurs fibres nerveuses, courtes et fines, mais par la préparation ordinaire il n'a pas été constaté de ganglions.

8⁰ Le *nerf acoustique (8)* est très distinct. Par opposition aux autres nerfs émanant des ganglions cérébroïdes, il prend naissance latéralement, du côté postérieur des ganglions. Il n'accompagne pas, comme c'est souvent le cas, le connectif cérébro-pédieux, mais suit plutôt, dans un certain parcours, le connectif cérébro-pleural, sans y être toutefois étroitement joint. Le nerf est logé dans le tissu conjonctif tendu entre les 3 ganglions principaux; dans le

dernier trajet, il suit le connectif pleuro-pédieux. Le lieu d'accès se trouve dans le bord antérieur de l'otocyste.

9° Le *nerf pénien (9)*. Tous les nerfs que nous venons de mentionner ont été appariés; le nerf pénien, au contraire, ne se trouve que dans le côté droit, où il part du ganglion cérébroïde près du côté extérieur du nerf labial médian. Son parcours a été décrit quand il a été traité des organes génitaux.

Le *connectif cérébro-buccal (10)* se détache du bord antérieur et supérieur du ganglion cérébroïde; il se porte en avant, et suit, en se courbant, le bord latéral, inférieur, du pharynx, puis il monte par un arc dirigé en avant, jusqu'au ganglion buccal *(gb)*. A la courbure, il émet deux nerfs *(11, 12)*, dont l'un, du côté antérieur, s'engage vite dans la musculature du pharynx, tandis que l'autre descend en forme d'arc; ces deux nerfs correspondent, selon toute vraisemblance, aux deux branches principales du *second nerf pharyngien (nervus pharyngealis secundus)* chez l'*Helix pomatia*.

Les *ganglions buccaux (gb)* mêmes se constatent à l'endroit ordinaire, près du lieu de naissance de l'œsophage sur le pharynx (pl. I, *gb*); ils constituent des nœuds courts, vigoureux, d'une forme ovale, faiblement pigmentés, et reliés entre eux par une commissure assez longue. D'ailleurs, outre les deux branches latérales partant du connectif cérébro-buccal et mentionnées plus haut, deux paires de nerfs se dirigent vers le pharynx, à savoir: du côté antérieur, le *premier nerf pharyngien (nervus pharyngealis primus, 13)*, qui, ainsi que chez l'*Helix pomatia*, croise la partie antérieure du conduit excréteur des glandes salivaires, et, en arrière, du côté ventral, une paire de nerfs courts, le *troisième nerf pharyngien (nervus pharyngealis tertius, 14)*, qui n'apparaît que si l'animal est examiné de derrière et d'en bas.

A l'œsophage se rend un nerf apparié qui prend naissance sur le côté médial du ganglion buccal: le *nerf gastrique antérieur (nervus gastricus anterior, 15)*. Un autre nerf, assez fort *(16)*, part de l'extrémité postérieure du ganglion et suit le conduit excréteur de la glande salivaire, contre lequel il est étroitement serré. Il m'était impossible de constater avec certitude si ce nerf se sépare peut-être plus haut du conduit salivaire et passe sur l'estomac, vu qu'il devient bientôt extrêmement fin et grêle. Il est par suite difficile à préciser. Chez l'*Helix pomatia* se trouvent deux nerfs, à savoir:

le nerf gastrique postérieur et le nerf de la glande salivaire, auxquels on peut comparer le nerf en question. Ces deux nerfs ont cependant chez l'*Helix* un autre point de départ, à savoir en avant sur le côté supérieur du ganglion buccal. J'étais d'abord enclin à croire que le nerf en question était identique au nerf gastrique postérieur de l'*Helix,* et cette désignation se trouve aussi sur la planche, mais comme il suit exactement, dans toute la première partie de son parcours, le conduit excréteur de la glande salivaire, j'ai fini par l'interpréter comme *nerf de la glande salivaire (nervus glandulae salivalis).* De la commissure buccale part de chaque côté, en avant, près des ganglions, et cachée sous l'œsophage, une fine bande conjonctive, pigmentée, allant au pharynx; cette bande renferme peut-être des fibres nerveuses.

Les ganglions pleuraux *(gpl)* innervent la musculature. Du côté extérieur part, enveloppé d'une bande conjonctive, un nerf grêle qui va au rétracteur externe *(re)*, le *nerf du rétracteur externe (17).* De ce même rétracteur se détache, plus en avant, une large bande conjonctive, contenant de nombreuses fibres musculaires, plus ou moins fines ou grossières, qui se rattachent au ganglion cérébroïde et aux connectifs cérébro-pleural et pleuro-pédieux, surtout à ce dernier.

Sur la face intérieure de chacun des deux ganglions pleuraux naît un nerf tout fin, se dirigeant vers le rétracteur pharyngien, à savoir le *nerf du muscle rétracteur du pharynx (n. musculi retractoris pharyngealis)*; il suit d'abord, sur une certaine étendue, le connectif cérébro-pleural, et puis se courbe, du côté médial, dans le rétracteur pharyngien, à l'endroit où celui-ci est suspendu, à l'aide de quelques bandes, à la face inférieure des ganglions cérébroïdes. Cette jonction, ainsi que les autres établies à l'aide de tissu conjonctif entre le système nerveux central et les rétracteurs, a certainement pour but de régler le déplacement des ganglions, quand l'animal se contracte.

Des ganglions pariétaux se dégagent les nerfs du manteau, *nerfs palléaux (18)*; celui du côté droit est de beaucoup le plus gros; chez quelques individus, il est même plus vigoureux qu'on ne l'a dessiné dans la figure; par opposition à ce qui s'observe chez l'*Helix,* il n'est pas double. Contre ce nerf et contre le ganglion pariétal droit se trouve étroitement serré le rétracteur de l'ommato-

phore droit. Le nerf pénètre dans le manteau du côté droit, là où celui-ci est soudé à la peau du corps et au diaphragme, et se continue au-dessus et du côté médial de l'anus.

Le nerf palléal gauche prend naissance à l'angle extérieur et antérieur du ganglion, passe par-dessus le bord du rétracteur externe, et s'engage dans la peau du corps, là où celle ci se rattache au manteau; puis il s'enfonce dans ce dernier suivant un trajet médial. Chez l'*Arion* on a démontré, à gauche, un nerf palléal double; chez le *Chondrina similis* celui-ci est simple, comme du côté droit.

En enlevant entièrement le système nerveux et en le plaçant sur une plaque noire, de sorte que la partie comprise entre l'aorte et le ganglion pariétal droit se détache sur un fond extrêmement sombre, j'ai réussi à constater la présence du *nerf aortique,* particulièrement fin et très court, qui ne s'observe que d'un côté, partant du ganglion pariétal droit.

Le ganglion viscéral *(gv)* émet en général deux nerfs non appariés et très vigoureux: le *nerf intestinal (19)* et le *nerf anal (20).* Ce dernier prend naissance au-dessous et un peu à gauche du nerf intestinal. Il passe bientôt sur le côté droit de l'animal, où il court sous les organes génitaux jusqu'à la partie de la paroi du corps située du côté columellaire sous le rectum et près du collier palléal. Un rameau latéral qui commence tout près du ganglion et qui suit exactement la branche principale, innerve une région se trouvant un peu plus haut dans le même tour.

Le *nerf intestinal (19)* accompagne l'aorte et passe, en arrière étroitement au-dessous du diaphragme (fig. 44 du texte, *ni*). A l'extrémité postérieure de la cavité pulmonaire, il forme un renflement ganglionnaire *(nig),* envoie une branche transversale très vigoureuse qui monte le long du rein *(nr),* puis se bifurque en deux rameaux dont l'un va à l'oviducte et à la prostate *(nso),* l'autre *(ng),* accompagné d'une branche artérielle volumineuse, à la partie supérieure de l'oviducte et à la glande albuminipare, d'où il se continue le long du canal hermaphrodite jusqu'à la glande hermaphrodite.

Ces deux nerfs que nous venons de décrire, sont ceux qui se trouvent en général chez les Pulmonés. Du côté gauche du ganglion part, en avant, un nerf *(21)* qui descend dans le bas de la cavité du corps, se porte directement en arrière, entre les rétrac-

teurs latéraux, traverse le rétracteur interne et se disperse enfin dans la peau et dans le bord du manteau situé derrière. Le trajet et l'origine sont analogues à ceux du nerf décrit, chez l'*Helix pomatia*, sous le nom de *nerf cutanéo-palléal.*

Schmalz[55]) (p. 532 et 539) indique que chez l'*Arion empiricorum*, ainsi que chez le genre *Limax*, le nerf se détache de l'extrémité postérieure du ganglion viscéral, aux environs du nerf intestinal.

Les *nerfs des ganglions pédieux**) peuvent se diviser en deux groupes: ceux qui prennent naissance plus du côté dorsal, et ceux qui ont leur origine sur le côté ventral. Ces derniers vont à la musculature du pied, les autres à la peau des côtés du corps et aux voies génitales. Les nerfs dorsaux sont au nombre de 3, dont l'antérieur court, à droite, entre le vagin et le pénis *(22)*; celui du milieu *(23)* se divise d'abord en deux ramifications, l'une antérieure, l'autre postérieure, qui, à leur tour, se bifurquent encore en deux branches, passant, l'une par-dessus, l'autre par-dessous le conduit excréteur femelle, qu'elles innervent en même temps, selon toute vraisemblance. Dans leur parcours elles traversent, à droite comme à gauche, le rétracteur externe, et se terminent à la peau qui couvre le côté du corps. Le nerf postérieur, dorsal *(24)*, est très grêle, il va directement à la peau latérale du corps. Le nombre des nerfs ventraux ayant leur origine sur les ganglions pédieux, droit et gauche, n'est pas toujours constant. L'individu figuré présentait, à droite, 6 nerfs pédieux profondément logés. De ces six, les trois postérieurs *(28—30)* vont, comme un faisceau directement dirigé en arrière, à la partie postérieure, libre, du pied; les deux situés en avant *(26, 27)* se portent vers le côté, et l'antérieur *(25)* s'avance obliquement pour aboutir dans le pied, du côté interne de l'attache du rétracteur pédieux. Ce dernier nerf envoie, pardessus le vagin, une fine ramification latérale, de manière que l'animal entièrement ou à demi contracté, présente en tout 4 nerfs se dégageant du ganglion pédieux droit, et passant au-dessus du vagin, pour s'épanouir enfin dans la peau.

Les ganglions cérébroïdes sont placés au-dessus de l'œsophage et en arrière du pharynx; ils sont visibles par-dessus, aussitôt que l'animal a été coupé dans la région de la nuque (pl. I). Les autres

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*) Dans la figure (pl. XXXII) seuls les nerfs qui viennent du ganglion pédieux droit sont dessinés.

ganglions situés plus en arrière ne s'aperçoivent qu'après que la partie antérieure de l'œsophage et les glandes salivaires ont été écartées. Au-dessous du cordon viscéral s'avance l'aorte céphalique *(ao)*, reliée au ganglion viscéral et au ganglion pariétal droit; elle se prolonge ensuite sous les ganglions cérébroïdes, en émettant une branche qui se porte au-dessous des ganglions pédieux *(apé)*; son trajet sera décrit avec plus de détails dans le chapitre sur le système des vaisseaux.

Vertigo moulinsiana Dup.

Figures 39—41 du texte.

La divergence entre le système nerveux de cette espèce et celui de l'espèce précédente n'est pas considérable. Le nombre des nerfs, ainsi que leur parcours, sont à peu près identiques, et ce n'est que dans les dimensions des ganglions, de leurs connectifs et de leurs commissures, qu'il existe une différence, bien qu'assez petite; par conséquent, ce ne sont que ces parties du système nerveux dont nous parlerons pour le *Vertigo moulinsiana*.

Les ganglions cérébroïdes *(gc)* sont relativement grands, ovales ou en forme de citron, et assez fortement pigmentés, à l'exception d'une tache située en avant sur la face extérieure (fig. 39). Ils sont unis par une commissure assez longue. Les ganglions buccaux *(gb)* sont relativement plus grands que chez le *Chondrina similis;* ils se relient aux ganglions cérébroïdes par un connectif assez court et fortement courbé; la commissure buccale est longue. Les grands ganglions pédieux *(gp)*, de forme ovale, ont une pigmentation plus faible que celle des ganglions cérébroïdes. Le nerf acoustique accompagne le connectif cérébro-pédieux jusqu'à l'otocyste (fig. 39). Les ganglions pleuraux (*gpl* et gpl_1) sont situés comme à l'ordinaire; ils sont petits, celui de gauche *(gpl)* plutôt triangulaire, celui de droite (gpl_1) à peu près globulaire. Les connectifs cérébro-pédieux et pleuro-pédieux ont une longueur considérable; les connectifs cérébro-pleuraux sont beaucoup plus courts. En comparaison du genre *Chondrina*, le cordon viscéral (fig. 40) est très court. Chez un individu à peu près entièrement étendu, si on le regardait d'en haut, les ganglions cérébroïdes cachaient, non seulement les ganglions pleuraux, mais même le ganglion pariétal droit et la plus grande partie du connectif pleuro-pariétal

du côté gauche. La meilleure manière de se faire une idée de la conformation du cordon viscéral, c'est donc d'examiner le système nerveux par derrière (fig. 41) ou, mieux encore, d'en bas (fig. 40). Pour ce qui concerne le ganglion pariétal gauche *(gpa)*, il a les mêmes dimensions relatives et la même position que chez le *Chon-*

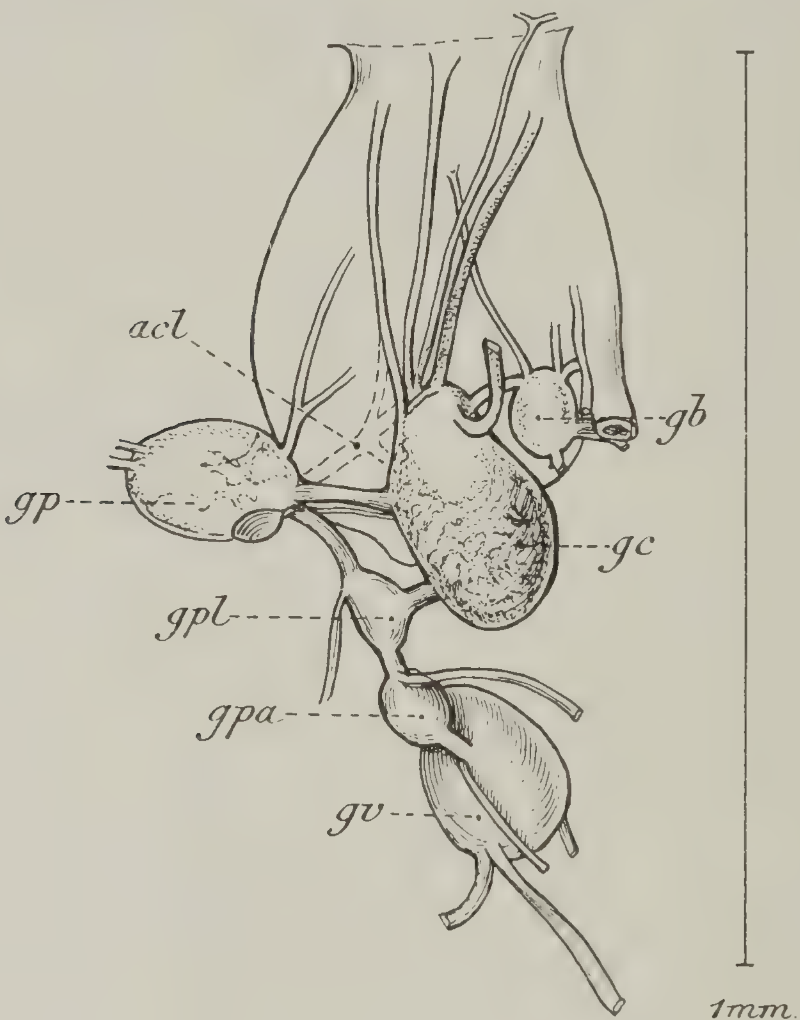


Fig. 39. Système nerveux central de *Vertigo moulinsiana* Dup., vu du côté gauche. — *acl*, artère céphalique latérale; *gb*. ganglion buccal ; *gc*, ganglion cérébroïde ; *gp*, ganglion pédieux ; *gpa*, ganglion pariétal gauche ; *gpl*, ganglion pleural gauche ; *gv*, ganglion viscéral.

drina; il est à peu près globulaire. Le ganglion pariétal droit *(gpa_1)* est extrêmement petit et si étroitement serré contre le ganglion pleural *(gpl_1)* qu'il est douteux que, pour ce côté, on puisse parler d'un connectif pleuro-pariétal. Le connectif pariéto-viscéral est également court. Il en résulte que le ganglion viscéral est placé de travers, plutôt vers le côté droit (fig. 40, *gv*). Ce ganglion est très grand; chez quelques individus, presque aussi grand que les ganglions cérébroïdes; il est irrégulièrement ovale ou en forme de fève, un peu aplati en-dessous, bombé en-dessus. Les ganglions

pleuraux et ceux du cordon viscéral sont blanchâtres et peu ou pas pigmentés; la plupart des nerfs, des connectifs et des commissures sont enveloppés d'un fort pigment noir.

Toutes les indications sur le système nerveux de la famille des *Pupillidae,* se trouvant dans la littérature malacologique, ne concernent que le système nerveux central. Il existe des remarques

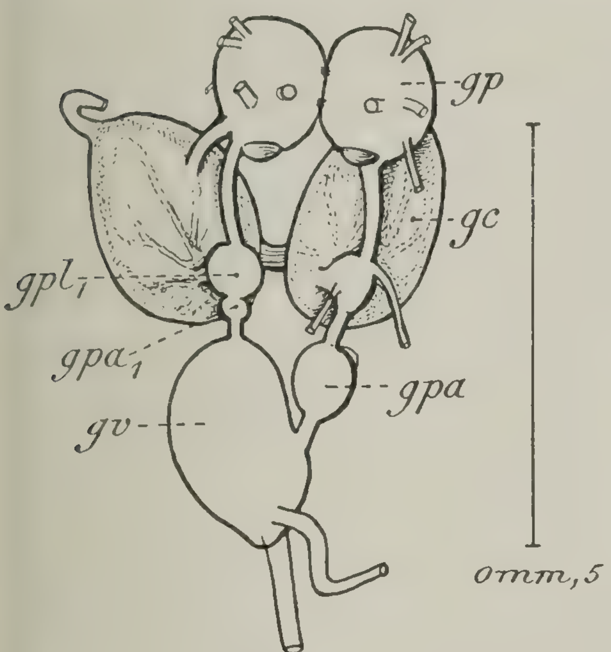


Fig. 40. Système nerveux central de *Vertigo moulinsiana* Dup., vu par-dessous. — *gpa*1, ganglion pariétal droit; *gpl*1, ganglion pleural droit. Les autres lettres comme sur la figure précédente.

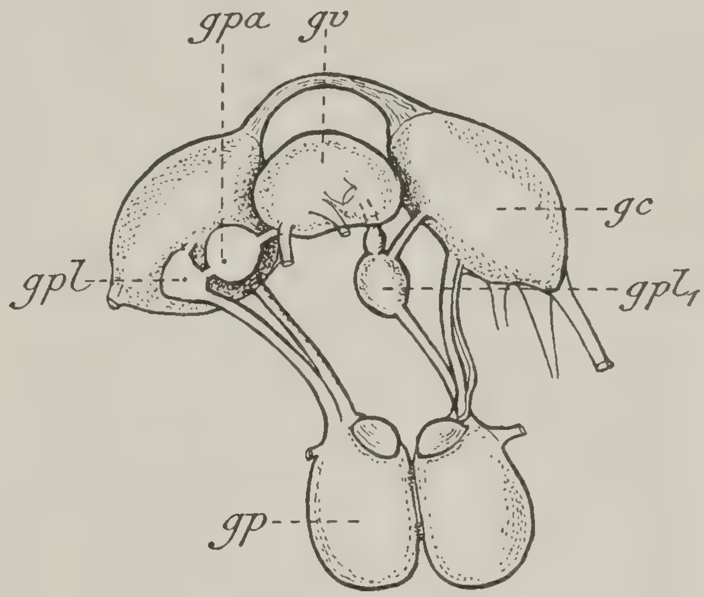


Fig. 41. Système nerveux central de *Vertigo moulinsiana* Dup., vu par derrière. — Mêmes lettres et même grossissement que pour les figures précédentes.

là-dessus çà et là dans la littérature ancienne, mais les observations et les figures sont extrêmement défectueuses, ou, à vrai dire, sans valeur. Ce n'est que pour être complet que nous les citerons ici (sous les noms modernes): Moquin-Tandon[41]), *Chondrina megacheilos,* pl. 25, fig. 27; *C. farinesii,* pl. 26, fig. 6; *Pupilla muscorum,* pl. 28, fig. 6; *Vertigo pygmæa,* pl. 28, fig. 41; Lehmann[33]), *Truncatellina costulata,* p. 147. Les anciennes reproductions du statocyste et de ses otoconies chez le *Vallonia pulchella* (figuré par Leidy: Binney[4]), vol. 1, pl. IX, fig. 7, 8, 9) et chez l'*Acanthinula harpa* (figuré par Morse[42]), pl. I, fig. 8, 9) sont assez bonnes, la figure du système nerveux chez la dernière espèce (pl. I, fig. 5) est au contraire moins correcte. Parmi les recherches plus récentes, qui sont toutes très exactes, il existe une description du

système nerveux chez l'*Orcula batumensis,* faite par Wiegmann-Hesse[30]), p. 6—7, et une figure, donnée par Soós[62]), fig. 42, de ce même système, vu de côté, chez l'*Aspasita triaria.* Simroth, qui a lui-même étudié le système nerveux chez plusieurs Pulmonés[60]), fait remarquer dans un autre de ses travaux[61]), p. 255, 263, que, chez les Maillots, le cordon viscéral a la structure originelle, se composant de 5 ganglions bien séparés, et que la commissure cérébrale ainsi que les connectifs sont bien développés, comme chez les Basommatophores. Watson[80]), p. 7—8, a demontré que les genres *Vallonia, Acanthinula, Patulastra* et *Pyramidula,* qui antérieurement ont été classés parmi les Hélicides, ne ressemblent pas à cette famille en ce qui concerne la structure du système nerveux, mais se joignent assez étroitement aux genres *Lauria, Vertigo, Ena* et *Cochlicopa.* Chez la famille des *Helicidae* se constate une agrégation intime des ganglions pédieux, pleuraux, pariétaux et du ganglion viscéral (abdominal), de même que ce dernier est complètement soudé avec le ganglion pariétal gauche (ganglion palléal gauche). Chez les formes mentionnées, les ganglions ne sont pas aussi étroitement unis, et les pédieux se trouvent à une certaine distance de ceux du cordon viscéral; d'ailleurs, il existe une fusion, plus ou moins complète, entre le ganglion viscéral (abdominal) et le ganglion pariétal (ganglion palléal) droit, non pas, comme c'est le cas chez les Hélicides, avec le gauche (fig. 2a, *Patulastra balmei;* 2b, *Vallonia costata*).

D'après les recherches ci-dessus citées et d'après mes propres études on arrive donc au résultat que le système nerveux, chez les vrais *Pupillidae,* est celui du type primitif, tandis que, chez les formes hélicides, on remarque une tendance à un peu plus de complexité (par ex. fusion des ganglions).

Musculature.

Chondrina similis Brug.

Pl. XXXIII.

Le muscle columellaire a été examiné chez le *Chondrina similis* Brug. et chez le *Vertigo moulinsiana* Dup. Chez le premier Maillot il est fixé à la columelle à une distance d'env. 3 tours à 3 tours $^1/_2$ de l'ouverture de la coquille; dans sa moitié proxi-

male il est étroit, pressé contre la columelle, et sa section transversale ne prend pas beaucoup de place. Après être arrivé au niveau de l'ouverture de la coquille (ou du bord du manteau) il se distribue dans les différents organes du corps, de la tête et du pied. On peut distinguer 2 faisceaux principaux: l'un droit *(retractor dexter, rd),* l'autre gauche *(retractor sinister, rs).* Celui de droite est le plus vigoureux. Tous deux sont assez indépendants l'un de l'autre, n'étant reliés que sur une courte étendue, aussitôt après leur naissance. Le rétracteur gauche *(rs)* vient s'insérer le plus haut sur la columelle; au point d'attache, le muscle est coupé en biais et un peu courbé, suivant l'enroulement en spirale de l'axe de la coquille; le rétracteur droit *(rd)* est, à l'attache, divisé en deux branches; l'une de celles-ci, semblable à une membrane, et assez étroite, est fixée de manière que sa ligne d'insertion forme un prolongement de la spirale dessinée par le lieu d'attache du rétracteur gauche; la seconde branche, qui est plus forte et plus musculeuse, se recourbe vers le rétracteur gauche auquel elle se fixe à peu près dans toute la largeur de celui-ci. La partie principale de chaque rétracteur est constituée par les muscles allant à la tête et aux régions latérales du pied *(retractor capitis et pedis),* appelés par Trappmann[77]): rétracteur externe *(retractor externus, re);* mais à celui-ci se joint encore des deux côtés un autre muscle; au rétracteur gauche: le rétracteur pharyngien *(rph)*; à l'autre, celui de droite, le rétracteur pédieux non apparié *(retractor internus, ri,* Trappmann, — ainsi appelé par opposition au rétracteur pédieux apparié, *retractor externus, re).* L'aspect du système rétracteur du côté gauche *(rs)* est celui qui suit: La région cachée dans la coquille (sac viscéral) forme une bande assez étroite, de la même largeur partout; cette bande se divise dans la partie inférieure du corps en deux sections, le rétracteur pharyngien *(rph)* se détachant à cet endroit; celui-ci est très vigoureux; aux environs du pharynx *(ph),* il s'élargit considérablement et se bifurque par une longue fente longitudinale. Le rétracteur de la tête et du pied *(retractor externus, re)* se divise en trois ramifications, dont l'une *(ro)* va à l'ommatophore *(om),* une autre *(rpt)* au petit tentacule et à la lèvre *(l)*, et la troisième au pied *(rpd).* Le muscle qui se dirige vers l'ommatophore part le premier. A la base de celui-ci, il s'épanouit considérablement en s'enroulant; les nerfs

optique et olfactif s'enfoncent, par la fente entre les bords libres, dans le cylindre creux que forme le muscle. Un peu plus du côté distal part une fibre musculaire toute fine, se portant de même à l'ommatophore. Le faisceau de muscles allant au petit tentacule et au lobe labial est très étroit à son lieu de naissance; la branche située le plus du côté dorsal se rend au petit tentacule *(rpt)*, les 6 autres au lobe labial *(l)*. Entre ces deux faisceaux principaux courent 2 filaments minces, s'arrêtant vis-à-vis du ganglion cérébroïde gauche, et se fixant probablement au tissu conjonctif qui l'entoure. La branche principale (la troisième portion) du rétracteur gauche *(retractor pedis sinister, rpd)* se déploie en éventail sur la face latérale du pied; elle comprend une dizaine de bandes musculaires presque toutes également vigoureuses.

Le rétracteur droit *(rd)* est plus fort. Dans la région proximale du muscle, la partie prédominante est celle qui se continue plus loin dans le rétracteur pédieux non apparié *(retractor internus, ri)*; dans la moitié supérieure de la région renfermée dans la coquille, c'est même cette partie qui forme seule le tronc principal de tout le système rétracteur du côté droit. Elle descend comme une large bande jusqu'au niveau du collier palléal *(m)*. Dans ce parcours se fixent à ses bords le diaphragme*) et le revêtement du corps. Après avoir dépassé le bord du manteau, la bande musculaire se continue dans la paroi postérieure du «pédoncule» de la masse viscérale (en formant une partie de celui-ci). En atteignant la queue, les fibres musculaires se divisent en deux groupes dont l'un, l'antérieur *(retractor anterior, ri_1)*, se porte vers le pied *(pi)*, tandis que l'autre, le postérieur *(r. posterior, ri_2)*, suit le côté dorsal de la queue. Autant qu'on peut le constater par la dissection, le parcours de ces deux parties est analogue à celui que décrit Trappmann[77]) pour l'*Helix pomatia*. Le rétracteur droit de la tête et du pied *(r. externus, re)* commence assez haut par sa portion la plus vigoureuse, environ à mi-chemin entre le bord du collier palléal et l'endroit où le rétracteur droit se rattache à la columelle. Parvenu au collier il se divise en plusieurs ramifications: une bande musculaire vigoureuse *(re_1)* se dirige vers l'ommatophore *(om)*, en envoyant une branche latérale

*) C'est à celui-ci que se rattache le rétracteur pénien *(rp)*; si donc on tient compte de la situation de ce dernier aux environs du rétracteur droit, il se présente peut-être une possibilité de l'en faire dériver.

au pénis *(pé)*; un peu plus du côté distal part une seconde *(re_2)*, dont la partie distale se ramifie en plusieurs filets minces; l'un de ceux-ci va à l'ommatophore, 3 au cloaque génital et au pénis, 1 au petit tentacule *(pt)*, et une 6e branche, très vigoureuse, aboutit au lobe labial *(l)*; cette dernière est renforcée par la 3e bande musculaire assez forte *(re_3)*. La 4e *(retractor pedis dexter, rpd)* s'épanouit en forme d'éventail et émet de nombreux ramuscules fins au côté droit de la région antérieure du pied. Quelques-uns de ceux qui sont situés le plus en avant, se rattachent au cloaque génital et au lobe labial. Toutes les fibres musculaires s'insérant plus en arrière sur la face latérale du pied, ont une origine indépendante sur le rétracteur interne, cette partie musculaire étant née de la réunion de 5—6 filaments qui, en s'approchant davantage du côté distal, se confondent en une seule bande, assez large; il est vrai que celle-ci est reliée, en avant, avec le tronc du rétracteur externe proprement dit, mais elle a pourtant un caractère assez indépendant.

Vertigo moulinsiana Dup.

Fig. 42 et 43 du texte.

Le muscle columellaire ressemble, pour les traits essentiels, à celui du Maillot que nous venons de décrire. Le rétracteur pharyngien fait en quelque sorte ici également partie de celui de gauche, et le rétracteur interne, de celui de droite, mais il n'existe pas beaucoup de relation entre les deux branches principales dont se compose chaque groupe, droit et gauche. Elles se relient toujours l'une à l'autre par du tissu conjonctif, mais si on les saisit chacune avec une pincette, on les sépare facilement sans déchirer les fibres musculaires, bien qu'au premier coup d'œil elles aient l'air d'être complètement fusionnées dans la partie proximale; aucun filament ne passe d'un muscle à l'autre. Le degré de la soudure varie chez les différents individus. Dans la fig. 42 se trouve reproduit un exemplaire chez lequel on pouvait facilement suivre chacune des 4 branches jusqu'à son point d'origine sur la columelle. Seulement, juste avant d'arriver à celle-ci, elles étaient plus étroitement unies par le tissu conjonctif. La disposition des 4 muscles était à l'attache columellaire, et en comptant du sommet de la coquille vers sa base, comme suit: le rétracteur pharyngien *(retractor pharyngis, rph)*,

le rétracteur gauche de la tête et du pied *(retractor externus sinister, re_1)*, le rétracteur interne *(retractor internus, ri)*, et le rétracteur droit de la tête et du pied *(retractor externus dexter, re)*. Le rétracteur pharyngien était imbriqué à sa base sur le rétracteur externe gauche, et celui-ci, de son côté, sur le rétracteur interne, par-dessus lequel était également situé, mais plus vers le bas, le

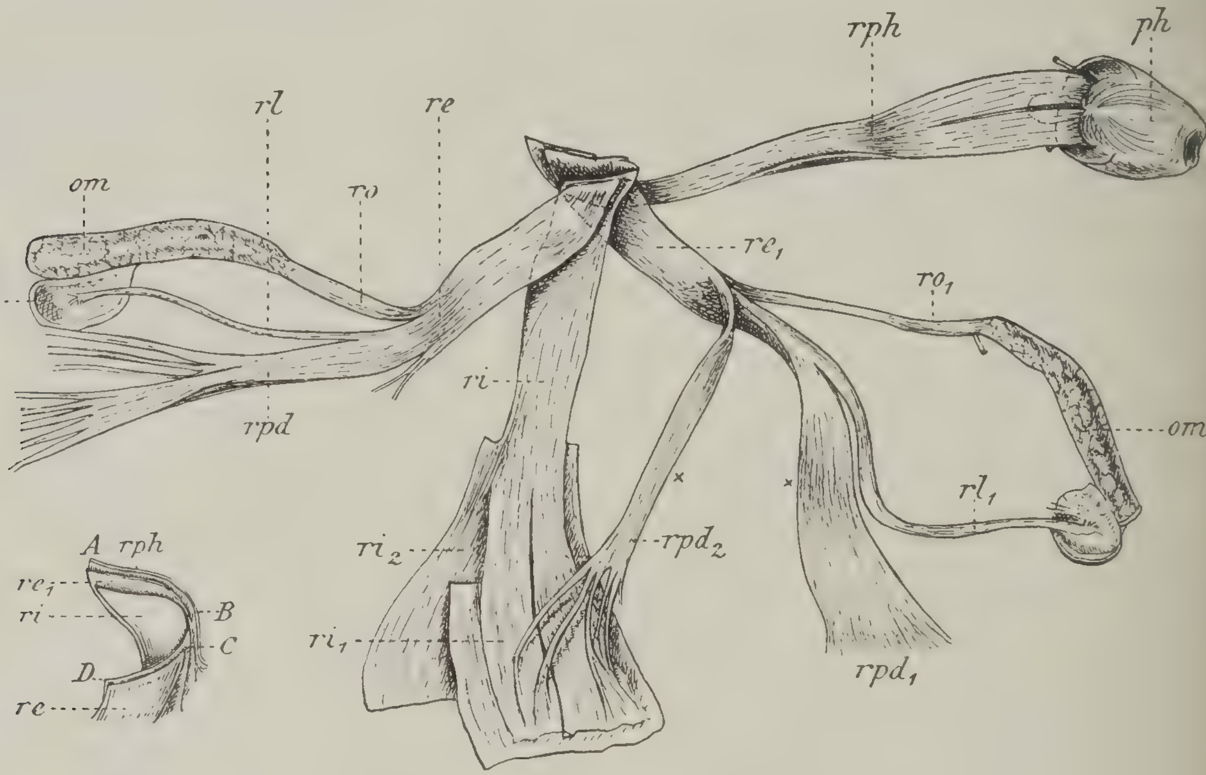


Fig. 42. Système rétracteur de *Vertigo moulinsiana* Dup. — *la*, lobe labial ; *om*, *om*1, ommatophores droit et gauche ; *ph*, pharynx ; *re*, *re*1, rétracteurs externes droit et gauche ; *ri*, rétracteur interne ; *ri*1, *ri*2, branches antérieure et postérieure de celui-ci ; *rl*, *rl*1, rétracteurs labiaux droit et gauche ; *ro*, *ro*1, rétracteurs d'ommatophore droit et gauche ; *rpd*, rétracteur pédieux droit ; *rpd*1, *rpd*2, rétracteur pédieux gauche ; ces deux faisceaux se touchent le long des bords marqués x ; *rph*, rétracteur pharyngien. — Fig. 43. Point d'attache des muscles columellaires sur la columelle chez un autre individu. — *A, B, C, D*, 4 points de la columelle ; *A* est situé du côté apical, *D*, du côté basilaire. Les autres lettres comme sur la figure précédente.

rétracteur externe droit. Chez un autre individu où la soudure des deux branches de chaque côté était plus marquée, la disposition et le mode d'imbrication étaient tels que le montre la fig. 43 : le rétracteur interne *(ri)* était très large, surtout au point d'attache à l'axe columellaire ; sa ligne d'insertion (de *A* à *D*) occupait donc un tour presque entier et par-dessus étaient placés : vers le bas, le rétracteur droit *(re*, de *C* à *D)* ; du côté apical, le rétracteur externe gauche *(re_1)*, et plus vers la périphérie, le rétracteur pharyngien *(rph)* ; les deux derniers étaient de la même largeur (de *A* à *B*).

Dans le côté droit (fig. 42) partent, du rétracteur externe *(re)*, d'abord le rétracteur de l'ommatophore *(ro)*, qui est très vigoreux et assez court chez l'exemplaire figuré, un peu contracté; puis, un peu plus du côté distal, une bande musculaire *(rl)* allant au lobe labial *(la)*. Comme il n'existe pas de petit tentacule chez le genre *Vertigo*, un muscle spécial pour celui-ci n'a pu être distingué. Le tronc principal va au côté droit du pied *(rpd)*. Il se compose de deux faisceaux, l'un antérieur, l'autre postérieur. Le premier se partage en 3 fibres musculaires, dont l'une se rattache à la base du cloaque génital. Le faisceau postérieur, qui se divise en 5—6 filaments, se dirige vers les régions moyenne et postérieure de la face latérale du pied. Pour ce qui concerne le rétracteur gauche de la tête et du pied (rétracteur externe sénestre, re_1), la structure est à peu près la même, seulement, après la bande musculaire allant au lobe labial (rl_1), il en part une lame musculaire, large et mince, de forme triangulaire (rpd_1), qui, au bord du pied, se distribue en ramuscules fins rayonnant dans ce dernier. La région postérieure de cette lame (rpd_2) s'est développée en une partie musculaire indépendante, dont les ramifications s'épanouissent librement dans le pied, en avant du rétracteur interne (ri_1). Au premier coup d'œil on croit constater un tronc antérieur du rétracteur interne, et un autre postérieur, dont le premier est formé par le système rétracteur du côté gauche, le second, par celui du côté droit. Cette circonstance s'explique cependant facilement de la manière ci-dessus mentionnée, si on considère que le rétracteur pédieux gauche s'étend si loin, dans la direction d'avant en arrière, que l'extrémité postérieure est obligée de se replier vers le milieu, en avant du rétracteur interne. Dans l'animal non préparé, les deux bords marqués d'un $\times$ sont donc situés tout près l'un de l'autre. Le rétracteur interne *(ri)* est divisé en deux parties, l'une droite, l'autre gauche; comme chez le *Chondrina similis*, il projette des fibres musculaires en avant vers le pied (ri_1), ainsi qu'en arrière vers la région de la queue (ri_2). Le rétracteur pharyngien *(rph)* se porte directement en avant jusqu'au pharynx, en augmentant progressivement de largeur.

Les différences les plus importantes entre le muscle columellaire du *Vertigo moulinsiana* et celui du *Chondrina similis* s'observent donc dans la partie proximale où les 4 rameaux apparaissent nettement indé-

pendants l'un de l'autre, de même que dans les dissemblances qui proviennent de la présence ou de l'absence de petits tentacules.

Des recherches sur la musculature de la famille des *Pupillidae* font presque complètement défaut. Chez Watson[80]), p. 14—15, se trouve une courte description du muscle columellaire chez les *Vallonia*, *Patulastra*, *Pyramidula* et *Lauria cylindracea*, ainsi que des figures schématiques des trois premiers genres (*V. pulchella*, fig. 5 c; *Patulastra balmei*, fig. 5 b et *Pyramidula rupestris*, fig. 5 a). Chez tous, le rétracteur pharyngien et le rétracteur externe gauche prennent naissance sur un seul et même tronc, et le rétracteur interne, ainsi que l'externe droit, sur un autre. Chez tous les *Pupillidae*, le rétracteur pénien a son origine sur le diaphragme, et le rétracteur de l'ommatophore court entre le pénis et le vagin. Se basant sur les examens faits par Wiegmann[30]), p. 2, Hesse parle en outre du système des rétracteurs chez l'*Orcula batumensis*, qu'il reproduit également, pl. I, fig. 1.

Système vasculaire.*)

Pl. II, fig. 3; pl. XIV, fig. 2; pl. XXXI, fig. 1, 2; pl. XXXII; pl. XXXIV, fig. 1, 2; fig. 39 et 44 du texte.

A cause de la petite taille que présentent les membres de cette famille, il est très difficile de suivre les ramifications plus fines des artères, et cette difficulté, bien entendu, augmente pour le système veineux. On peut, il est vrai, injecter les formes plus grandes, par exemple le *Chondrina similis*, mais comme je ne possédais pas de matériaux vivants, l'encre de Chine, employée pour l'injection, ne pouvait pénétrer que jusqu'à une certaine profondeur, dans l'aorte des individus fixés. Chez quelques espèces, par exemple dans le genre *Vertigo*, les artères hépatiques situées superficiellement sont revêtues d'une couche calcaire qui permet de distinguer nettement leur cours. Dans ce qui suit, nous nous contenterons donc de donner quelques traits principaux de la structure du cœur et du parcours des artères, de même que, pour le système veineux, nous ne ferons mention que de la veine pulmonaire. Chez tous les exemplaires étudiés, cette dernière (pl. XXXIV, fig. 1, 2, *vp*)

*) Nous nous sommes servi ici, autant que possible, de la même nomenclature que chez G. Schmidt[58]), mais il existe plusieurs dissemblances dans le système vasculaire entre l'*Helix* et les *Pupillidae*.

se voit nettement sous le plafond pulmonaire comme un vaisseau s'étendant un peu obliquement dans le sens de la longueur. Elle commence au collier palléal, près du pneumostome, se porte de biais vers l'extrémité du rein, pour se continuer le long du côté extérieur et inférieur de celui-ci jusqu'à l'oreillette. Dans tout le parcours on ne voit aucune ramification, pas même à l'aide du grossissement du microscope. Le cœur se trouve renfermé dans un péricarde fusiforme (pl. XXXIV, fig. 2, *pc*) qui est situé dans la région inférieure et postérieure de la cavité pulmonaire. L'oreillette (pl. XXXIV, fig. 1, *or*) est le plus souvent inférieure en dimensions au ventricule *(ve)*, avec lequel elle est en communication par une partie pédonculaire, étroite. La paroi de l'oreillette est mince, blanchâtre, celle du ventricule plus épaisse, mais d'une consistance plus lâche et plus spongieuse. L'aorte (fig. 44 du texte, *ao*) sort du cœur comme un tube, considérablement plus étroit que le ventricule. Elle se bifurque presque aussitôt et émet une branche plus vigoureuse, l'aorte antérieure (fig. 44, *aoa*), et une autre un peu plus faible. Cette dernière, l'aorte postérieure *(aop)*, longe la limite inférieure et intérieure du foie inférieur. Chez le *Chondrina similis* elle s'éloigne assez vite de la surface et s'engage entre les deux branches de la grande anse intestinale, en émettant dans son trajet plusieurs rameaux qui se portent vers le foie. Chez le genre *Vertigo*, l'aorte postérieure reste plus longtemps à la surface et envoie une forte branche le long de l'étroite partie hépatique située en avant de l'estomac (pl. XXXI, fig. 1, 2, *aop*). La ramification plus grande, l'aorte antérieure (fig. 44 du texte, *aoa*), contourne, en décrivant une courbe marquée en forme d'U, l'endroit où se replie la grande anse intestinale *(in)*. A la courbure naît un ramuscule très fin, se dirigeant vers le haut du tour. L'aorte se prolonge de là directement en avant, cachée d'abord en partie par le spermoviducte, mais ayant plus tard son trajet le long de celui-ci et du nerf viscéral, juste au-dessous du diaphragme, auquel elle est soudée presque sur tous les points. Avant de commencer son parcours en avant, l'aorte projette une branche très forte qui, avec quelques ramifications du nerf intestinal, passe par-dessus l'œsophage, mais au-dessous du spermoviducte, sur le côté columellaire, où, d'une part, elle se distribue dans la région supérieure de l'oviducte, d'autre part, se continue le long du canal

hermaphrodite jusqu'à la glande hermaphrodite *(arteria genitalis*, fig. 44, *ag)*. Une autre branche beaucoup plus fine suit, avec le nerf rénal *(nr)*, le bord du rein.

Un peu avant d'arriver au bord du manteau, l'aorte fournit à gauche un tronc vasculaire assez grand, qui bientôt se bifurque;

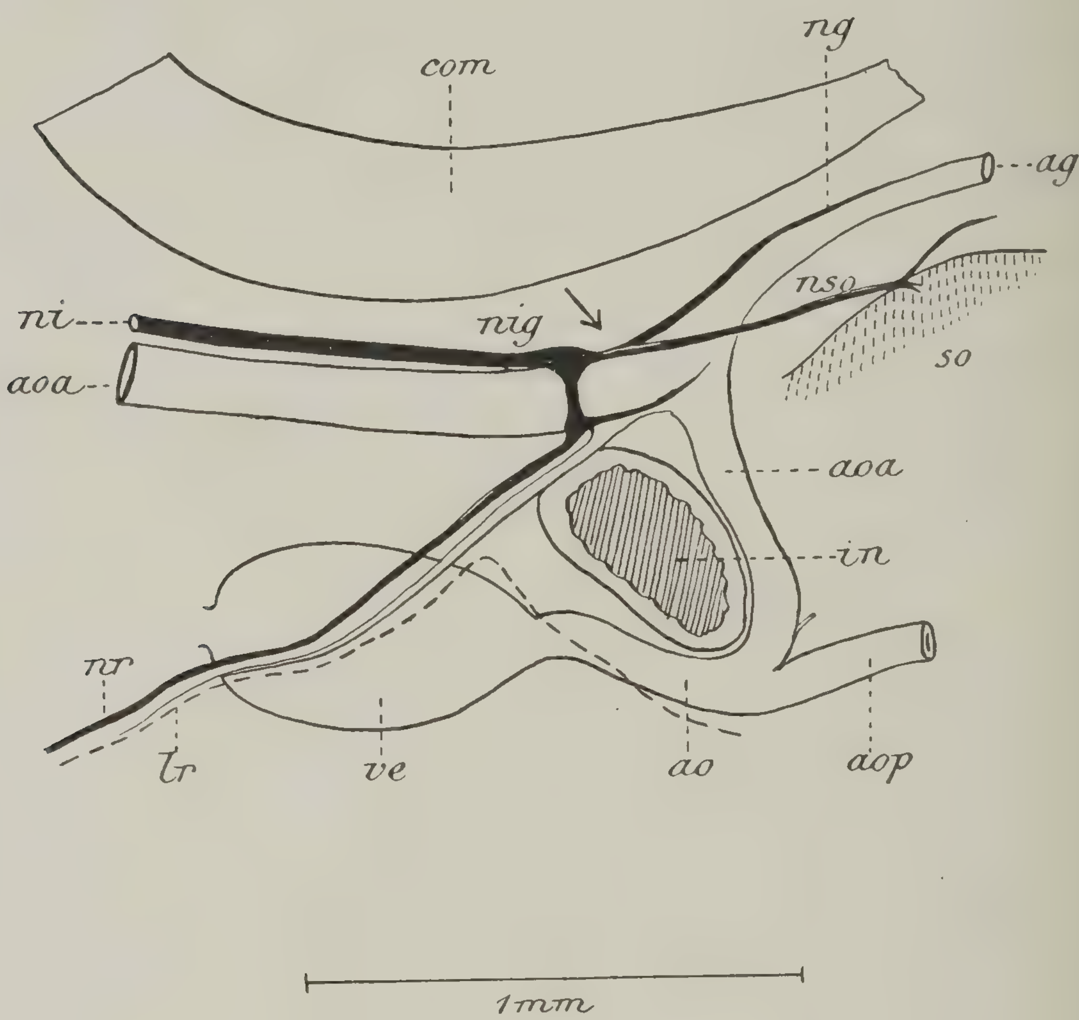


Fig. 44. Premières ramifications de l'aorte et parcours distal du nerf viscéral chez *Chondrina similis* Brug. — *ag*, artère génitale; *ao*, aorte; *aoa*, aorte antérieure; *aop*, aorte postérieure; *com*, muscle columellaire; *in*, intestin; *lr*, limite du rein (indiquée par une suite de petites lignes); *ng*, *nso*, ramifications distales du nerf intestinal; *ni*, nerf intestinal; *nig*, renflement ganglionnaire sur le nerf intestinal; *nr*, nerf ayant son parcours le long de la limite du rein; *so*, spermoviducte; *ve*, ventricule.

les deux branches sont à cheval sur les muscles rétracteurs. La droite se porte, par-dessous l'oviducte libre et le pédoncule de la poche copulatrice, vers le côté droit du collier palléal, en envoyant un fin ramuscule au diaphragme. La branche gauche va aux glandes salivaires pour se continuer le long du nerf palléal gauche jusqu'au côté sénestre du manteau.

Quand l'aorte a atteint le cordon viscéral, contre lequel elle

est, à cet endroit, étroitement serrée, le nerf anal se glisse au-dessous d'elle en décrivant une courbe (pl. XXXII, *ao*); le tronc aortique se continue ensuite en avant, au-dessous de l'œsophage et des glandes salivaires; en traversant le collier œsophagien, par-dessus les ganglions pédieux, il émet une branche vigoureuse, l'artère pédieuse *(arteria pedalis, apé)*, qui tourne l'extrémité antérieure des ganglions mentionnés, sous lesquels elle se glisse ensuite d'avant en arrière pour se continuer dans le même sens au-dessus de la glande pédieuse jusqu'à l'extrémité postérieure de celle-ci; là elle s'enfonce dans le pied, aux deux côtés duquel elle envoie une forte ramification.

Le tronc principal, au contraire, se prolonge en avant sous le nom d'artère buccale *(arteria buccalis)*. Celle-ci projette deux branches latérales, d'abord une à droite, puis une autre à gauche. Ces branches, les artères céphaliques latérales (fig. 39 du texte, *acl*), montent le long du connectif cérébro-pédieux, immédiatement en avant de celui-ci. Quand elles arrivent aux nerfs venant des ganglions cérébroïdes, elles se divisent en plusieurs ramuscules qui accompagnent les nerfs cérébroïdes les plus importants, comme par exemple les nerfs des ommatophores et le nerf labial médian.

Après avoir émis ces deux branches, le tube, ayant beaucoup diminué de calibre, forme l'artère buccale proprement dite (pl. XXXII, *ab*), qui court entre les rameaux du rétracteur pharyngien pour s'enfoncer d'en bas dans la masse buccale, au-dessous de la papille radulaire.

Les organes de la cavité pulmonaire.

Pl. II, fig. 3; Pl. XIV, fig. 2; pl. XXXIV, fig. 1, 2; fig. 45—47 du texte.

La structure des parois de la cavité pulmonaire est très uniforme chez tous les individus examinés de la famille en question. La longueur de la cavité varie un peu suivant le nombre des tours, de même qu'elle dépend aussi du degré de contraction. Dans la pl. II, fig. 3, elle est assez courte, le dessin étant fait d'après un animal contracté.

Les organes de la cavité ont été étudiés chez toutes les espèces dont les organes génitaux se trouvent reproduits, mais, vu la grande ressemblance de conformation, nous ne les avons figurés que pour quatre espèces: l'*Abida secale* (pl. II, fig. 3), l'*Orcula dolium* (pl.

XXXIV, fig. 1), *Lauria cylindracea* (pl. XIV, fig. 2) et *Vertigo moulinsiana* (pl. XXXIV, fig. 2). Le plancher de la cavité est constitué par une membrane conjonctive résistante, dans laquelle rayonnent les fibres du muscle columellaire, et à la face inférieure de laquelle se rattache le rétracteur du pénis. Au plafond de cette même cavité sont reliés le rein, le péricarde avec le cœur, la veine pulmonaire, et — le long du bord columellaire supérieur — le rectum. A la hauteur de la partie distale de ce dernier se voit l'organe de Mermod. Le cœur et la veine pulmonaire ont été décrits dans le paragraphe du système vasculaire. Nous nous occuperons ici du rein, du rectum, de l'organe de Mermod et du collier palléal.

La région sécrétante du rein («sac rénal» Bergh) constitue un sac, quelquefois triangulaire, quelquefois courbé et piriforme, situé en arrière dans la cavité pulmonaire *(rn)*. Sa portion principale se trouve placée entre le péricarde et le rectum, dont elle n'est séparée que par une partie étroite. A travers la paroi, qui est extrêmement mince, on peut voir dans l'intérieur, rempli de plusieurs lamelles longitudinales de diverse longueur, et qui ont souvent un parcours assez irrégulier. La section en avant du péricarde est sans doute aussi apte à fonctionner, au moins chez quelques-unes des formes (*Vertigo*, pl. XXXIV, fig. 2, rn_1). Regardée du dehors, cette partie se continue insensiblement dans la région antérieure étroite, l'uretère primaire *(ur)*, s'étendant à peu près jusqu'au bord de la cavité pulmonaire, et qui est à considérer uniquement comme une voie d'excrétion. A l'embouchure, l'extrémité se courbe légèrement en dedans, vers le rectum, en forme de crochet, de manière que l'orifice *(of)* ne soit pas tourné en avant, mais vers le côté columellaire. En dehors de l'orifice rénal, et le long de la partie antérieure du conduit excréteur du rein, s'observe une étroite bande blanche *(cv)* qui, au début, se dessine nettement contre le plafond de la cavité pulmonaire, mais qui, postérieurement, devient de moins en moins accentuée, pour s'effacer enfin complètement. Cette bande a plutôt le caractère d'une élévation en forme de coussin, dont le bord columellaire est le plus haut, et qui s'abaisse vers l'uretère. Chez l'*Acanthinula*, le bord de ce dernier s'avance un peu sur le coussin, de sorte qu'il se forme dans celui-ci une faible dépression semblable à une rainure, ainsi que Beck[2]) (p. 245—248) l'a décrit pour les *Buliminus (Ena)*. Cette rainure se constate aussi

chez l'*Orcula* et chez plusieurs autres genres, mais elle est d'ailleurs très peu développée *(Vertigo).* Chez les *Buliminus* son épithélium ressemble tout à fait à celui de la partie extérieure du rein, ou canal excréteur (l'uretère); il renferme aussi les cellules particulières en forme d'étoiles [2]), pl. 10, fig. 51, et Beck voit dans cette rainure la partie extérieure, courbée et non fermée, de l'uretère primaire (l. c., p. 250 et 251, fig. 28 *C* du texte), tandis que d'autres, par exemple Watson [80]) (p. 9 et 10) la désignent sous le nom d'uretère secondaire.

La communication entre le rein et le péricarde, le canal rénopéricardique, est toujours facile à découvrir sur les coupes en série; elle a été constatée chez la plupart des genres. Chez le *Vertigo moulinsiana* elle consiste en un tube long d'env. 70 μ, et formé d'un épithélium simple, d'épaisseur variable, aplati (pavimenteux) vers le péricarde, cylindrique vers le côté du rein. Les cellules sont revêtues de cils vibratiles extrêmement longs.

En 1920 Mermod [39]) a appelé l'attention sur un organe pulsateur qui, chez l'*Hyalinia lucida* Drap., était logé dans le plafond de la cavité pulmonaire, tout près du pneumostome. Il était limité d'un côté par le collier palléal, de l'autre par le sphincter du rectum. Il avait l'aspect d'une poche ou hernie; sa partie basilaire se détachait de la veine qui accompagne le rectum («veine circulaire»), et son sommet s'avançait dans l'uretère. L'endroit était facilement reconnaissable par sa forte pigmentation. L'organe n'est certainement pas réservé au genre *Hyalinia*; il est évidemment assez commun; mais comme il est surtout visible quand il bat, les auteurs précédents ne l'ont pas remarqué. Chez les individus de la famille des *Pupillidae*, je l'ai constaté dans tous les cas où je l'ai recherché (pl. XXX, fig. 4; fig. 21 du texte, *mo*). Comme il est en général pigmenté, on le voit facilement chez les spécimens préparés, mais je l'ai remarqué également chez quelques exemplaires vivants, par exemple chez le *Chondrina similis* (fig. 21 du texte, *mo*). L'organe ne battait que 6 fois par minute, mais l'animal avait été retiré de sa coquille pendant quelque temps. Mermod établit deux hypothèses sur les fonctions de l'organe: 1° Celui-ci serait une sorte de cœur secondaire, poussant le sang veineux de la veine circulaire dans le poumon et la veine pulmonaire; 2° l'organe serait destiné à aider à l'évacuation des matières sécrétées par le rein, c'est-à-dire à fonctionner comme une sorte de pompe aspirante et

foulante. Ici, chez les Pupillidae, où un uretère secondaire fait défaut, et où l'organe n'a aucune relation avec l'uretère, on peut laisser de côté cette dernière possibilité, tandis que la première, au contraire, est très vraisemblable.

Vu du dehors, dans sa position naturelle, le bord du manteau (fig. 45 et 46 du texte) forme, à l'ouverture de la coquille, un collier complet, plus large du côté columellaire, plus étroit vers l'extérieur. Il n'existe pas de formations de lobes marquées, excepté au-dessus et au-dessous du pneumostome *(op)*, où le bord intérieur du collier fait un peu saillie, plus fortement du côté inférieur. Le pneumostome est séparé de la cavité se trouvant derrière le collier par une barrière qui n'atteint pas la surface (fig. 46 du texte, à la hauteur de la flèche). Si cette barrière est fendue dans la direction qu'indique la flèche de la fig. 46, on peut se faire une idée du rapport entre la partie distale du rectum et le pneumostome (fig. 47 du texte). Le rectum *(III)* se prolonge en avant par deux bourrelets, dont les extrémités se voient même du dehors quand le pneumostome est fortement dilaté. Ils forment une rainure ouverte qui continue directement la lumière du rectum. Toute la partie de ce dernier dont nous venons de parler ne se voit pas du dedans sans préparation, étant cachée par la barrière mentionnée plus haut.

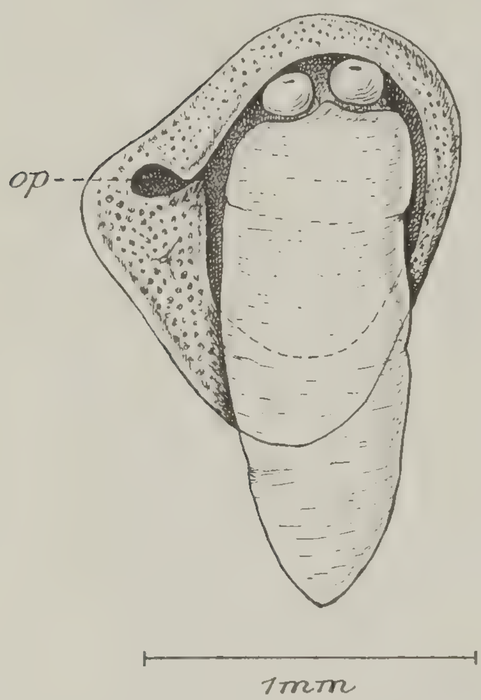
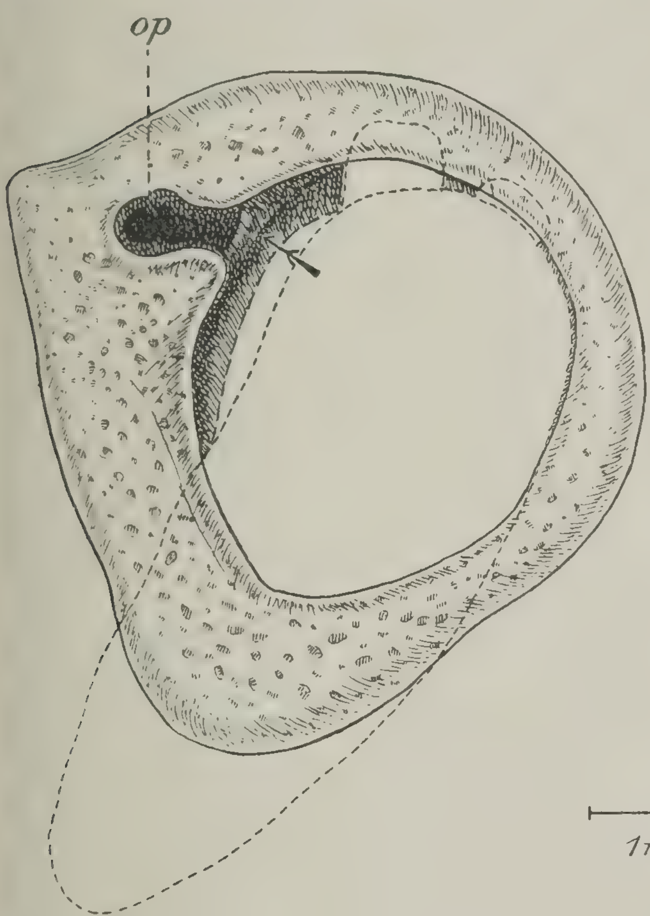


Fig. 45. Collier palléal et sole pédieuse d'*Abida secale* Drap. — *op*, pneumostome.

Bibliographie au sujet des organes de la cavité pulmonaire: Behme[3]), a décrit l'aspect du rein chez le *Chondrina avenacea*, p. 13, et chez le *Vallonia pulchella*, p. 5, 9. Déjà l'année précédente M. Braun[15]), p. 132, avait attiré l'attention sur la structure simple du rein chez le *Chondrina avenacea*. Plus tard cette structure a été mentionnée plusieurs fois pour le genre «*Pupa*» ou *Vallonia*, ou pour les deux, par Wiegmann[86]), p. 238,[87]), p. 12, 13, Simroth[59]), p. 67, 70,[61]), p. 401, Pilsbry et d'autres. D'après les examens faits par Wiegmann, Hesse[30]) décrit l'aspect du rein chez les espèces *Orcula batumensis*, p. 4, et *O. orientalis*, p. 9, pl. 1, fig. 9, ainsi que chez le *Pyramidula rupestris*[26]), p. 115. Hanna[22]), p. 375, indique que chez le *Columella edentula*, le tissu rénal n'est pas disposé en rangées longitudinales, comme c'est l'ordinaire

dans cette famille, et l'auteur de la présente étude donne une description et une figure d'ensemble du rein chez le *Vallonia costata*[65]), p. 13, fig. 7. Watson a fourni enfin[80]), p. 8—11, une exposition excellente du rein chez les genres *Vallonia, Acanthinula, Pyramidula* et *Patulastra*, avec des reproductions pour les *Vallonia pulchella*, fig. 3b, *V. excentrica*, pl. I, fig. 1, *Acanthinula lamellata*, fig. 3d, *A. aculeata*, fig. 3e, *Patulastra balmei*, fig. 3a, et *Pyramidula rupestris*, pl. II, fig. 3.



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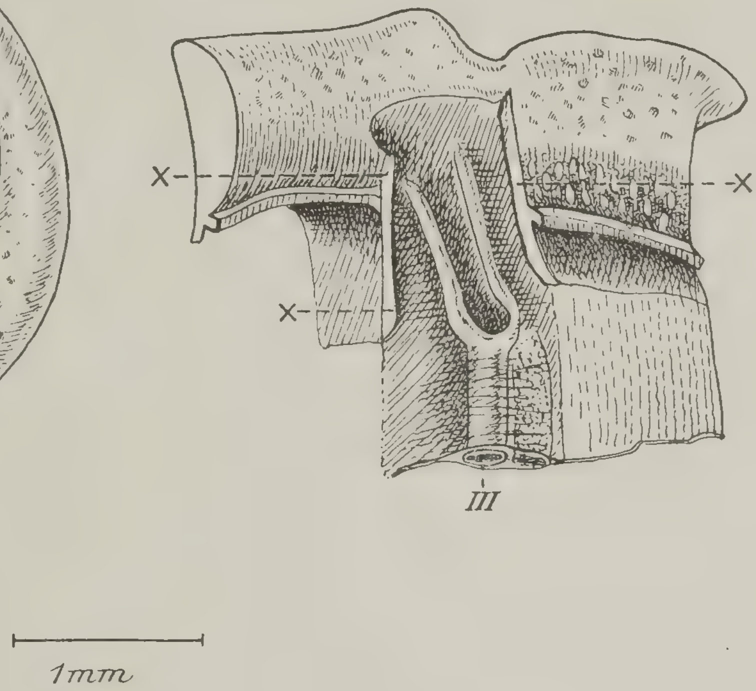

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Fig. 46. Collier palléal de *Chondrina similis* Brug. Pied et tentacules sont indiqués par des lignes pointillées. — Fig. 47. Pneumostome et parties avoisinantes; même espèce. La barrière en face de la flèche de la fig. 46 a été fendue. — *op*, pneumostome ; *xx*, bords de la fente pratiquée dans la barrière; *III*, rectum.

L'impression que nous donne l'étude des descriptions et des figures de la littérature malacologique, est que le rein est un organe très peu variable chez la famille des *Pupillidae*; c'est, comme on a pu le constater, à ce même résultat que m'ont amené mes propres recherches. Dans une espèce seulement: l'*Acanthinula aculeata*, il a été observé, selon Watson, une différence; en effet, la partie antérieure de la rainure ouverte, qui de l'orifice rénal conduit en arrière (l'uretère secondaire, Watson), est fermée, de sorte que les excrétions s'évacuent en arrière, à la hauteur de l'endroit où la

région fonctionnante du rein (sac rénal) passe dans l'étroite partie excrétrice antérieure.

Un rein semblable à celui qui a été décrit pour la famille des *Pupillidae*, s'observe chez la plupart des Basommatophores; il est donc souvent désigné sous le nom de «rein de Basommatophore»; une pareille structure rénale se retrouve chez plusieurs familles des Stylommatophores, que Pilsbry[49]), p. 562, réunit en un groupe appelé les *Orthurethra*. Les familles restantes appartenant au sous-ordre des Stylommatophores ont été rangées par ce même auteur dans deux autres groupes coordonnés aux *Orthurethra*: les *Heterurethra* et les *Sigmurethra*. L'uretère de ce dernier se replie pour longer le côté du rein jusqu'à la base de la cavité pulmonaire, d'où il se continue en avant le long du rectum; son parcours a donc la forme d'un S (d'où le nom *Sigmurethra*). Il ne s'ouvre que rarement à la base du rein.

Chez le groupe des *Heterurethra* le rein est situé de travers dans la région postérieure de la cavité pulmonaire, perpendiculairement sur le cœur et sur le rectum. Sa pointe est tournée vers ce dernier, et l'uretère suit l'anse intestinale et le rectum jusqu'au bord du manteau. Nous avons indiqué les trois formes principales de la structure du rein et de l'uretère, vu que Pilsbry s'en est servi pour le classement systématique des Stylommatophores.

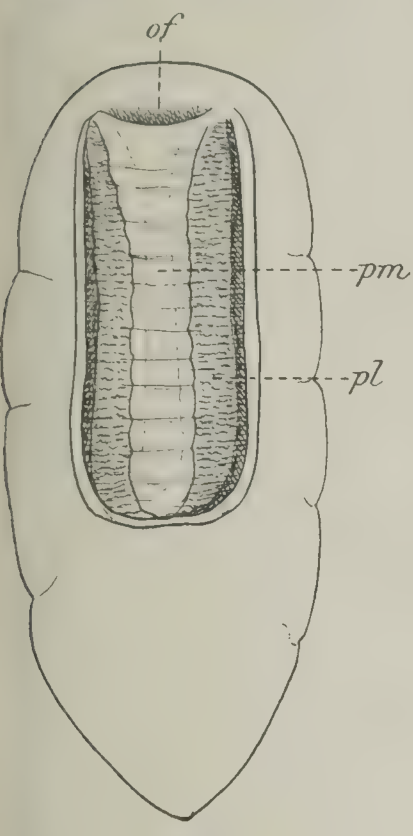
Moquin-Tandon[41]) a fourni, pour plusieurs espèces, une description assez détaillée du bord du manteau ainsi que de l'aspect du reste de l'animal. Hesse (Wiegmann)[30]) parle de la structure du collier palléal chez les *Orcula batumensis* et *orientalis*, et donne une reproduction de celui-ci chez la dernière espèce (pl. I, fig. 7). Il fait mention de deux lobes, un gauche et un droit. Ce ne sont que les deux saillies qui délimitent le pneumostome en haut et en bas; celle du côté droit est cependant indépendante jusqu'à un certain point, étant délimitée en bas par une entaille, ce qui, en général, ne se voit pas dans cette famille.

Pied et glande pédieuse.

Fig. 48—50 du texte.

Chez tous les individus examinés, le pied ne présente pas de sillon péripédieux ni de glande caudale, mais il existe toujours une glande pédieuse bien développée. Cet organe est assez semblable

chez les divers genres des *Pupillidae.* Il en a été donné ici des figures provenant du *Vertigo moulinsiana* et du *Chondrina similis.*



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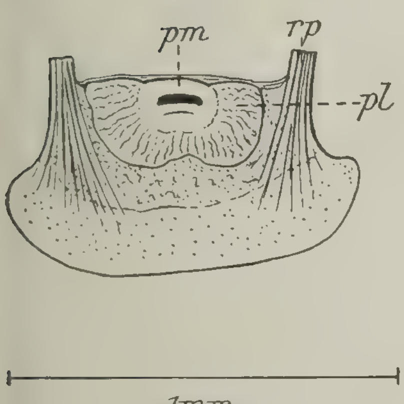

49

Fig. 48. Pied et glande pédieuse chez *Vertigo moulinsiana* Dup. — Fig. 49. Coupe transversale de ces mêmes organes.— *of*, orifice de la glande pédieuse; *pl*, partie latérale de cette glande; *pm*, partie médiale; dans la fig. 48 la lumière est indiquée par une ligne pointillée; *rp*, rétracteur pédieux.

Chez la première de ces espèces (fig. 48 et 49), la glande pédieuse parcourt les deux tiers du pied, jusqu'à l'endroit où le pédoncule du sac viscéral passe, en se courbant, dans la région postérieure du pied, appelée «queue». Elle forme un tube ayant à peu près la même largeur dans toute l'étendue de la glande, un peu dilaté seulement en avant, entre la tête et le bord pédieux antérieur *(of).* Sur une coupe transversale menée dans la partie moyenne du pied (fig. 49), on peut constater que la lumière *(pm)* en est très basse, mais large, entourée sur les faces latérales et en bas par une sorte de manteau de substance glandulaire *(pl).* Des deux côtés du tube, la largeur de ce manteau correspond à peu près à celle du tube lui-même. La zone glandulaire est limitée, sur les côtés latéraux, par plusieurs fibres venant du rétracteur pédieux *(rp)* et se distribuant dans le pied. En haut, vers la cavité du corps, elle n'est recouverte que par une couche extrêmement mince de filaments musculaires et conjonctifs, à travers laquelle on distingue assez facilement les différentes parties de la glande. Chez le *Chondrina similis* (fig. 50), cette glande a une structure semblable; elle n'est guère aussi longue et aussi large, et en avant, à l'embouchure, elle est élargie en forme d'entonnoir *(of).* Ces différences de dimensions sont dues peut-être en partie à la préparation, vu qu'on ne réussit jamais à étendre les individus du *Vertigo* aussi complètement que les grands exemplaires des genres *Chondrina* et *Abida.*

Dans la littérature malacologique on ne connaît pas non plus de Maillot à sillon péripédieux; les côtés de la partie inférieure du corps descendent toujours en se courbant régulièrement en dehors jusqu'au

bord du pied.*) Suivant les recherches de Watson[80]), p. 7, les genres *Vallonia*, *Acanthinula* (fig. 1 c), *Pyramidula* (fig. 1 a) et *Patulastra* ont un aspect analogue à celui des *Pupillidae* décrits ci-dessus, sans sillon péripédieux et avec une glande pédieuse semblable, à paroi dorsale lisse et non pas munie de plis longitudinaux comme chez la famille des *Helicidae*.

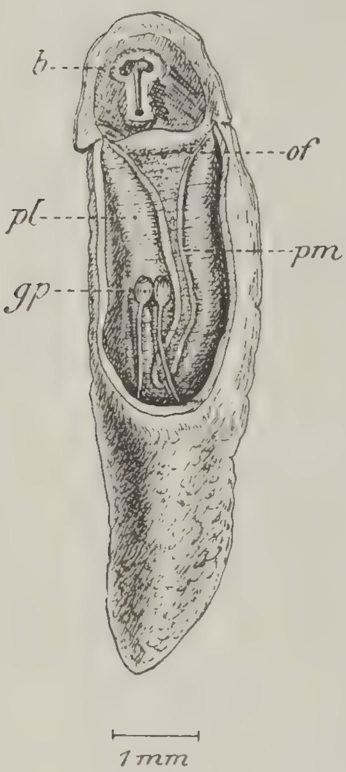

Fig. 50. Pied et glande pédieuse de *Chondrina similis* Brug. — *b*, bouche, vue en dedans ; *gp*, ganglion pédieux ; *of*, orifice de la glande pédieuse; *pl*, partie latérale de cette glande ; *pm*, lumière de celle-ci.

Sterki[70, 71]) a étudié l'aspect de la sole pédieuse des Pulmonés, et le nombre d'ondulations qui la traversent quand l'animal rampe le plus vivement. Il a examiné de même quelques espèces de la famille des *Pupillidae:* le *Gastrocopta armifera* Say[70]), p. 52, dont le pied n'est pas divisé en zones longitudinales. Quatre ondes traversent en même temps celui-ci dans toute sa largeur. Le *G. pentodon* Say[71]), p. 64, présente trois ondes de contraction simultanées, qui occupent presque toute la largeur du pied, et, par conséquent, pas de division en zones. Chez le *Vertigo ovata* Say[70]), p. 52, la sole est partagée, au contraire, en trois zones longitudinales; celle du milieu s'élargit en avant, de sorte que les deux autres, marginales, s'effacent alors. Deux ou trois ondes plissent en même temps la zone moyenne.

A ces études je suis en mesure d'ajouter une observation sur l'*Acanthinula harpa* Say. On ne constate, chez cette espèce, que deux ou trois ondes, larges et claires, qui traversent simultanément le pied dans toute sa largeur; il ne s'aperçoit donc pas de divisions longitudinales. L'animal peut sécréter une sorte de mucus tenace, dont il se forme un filament muqueux partant de l'extrémité du pied, et par ce fil il est à même de se laisser glisser en bas, comme c'est le cas pour plusieurs Pulmonés, par exemple pour les genres *Agriolimax*, *Limax*, *Vitrina* et *Cochlicopa*.

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*) Un Stylommatophore pourvu d'un sillon s'étendant parallèlement au bord du pied et au-dessus de celui-ci (sillon péripédieux) est appelé par Pilsbry[47]) (p. 110): *aulacopode*. Si ce sillon n'existe pas, l'individu est nommé *holopode*. Tous les exemplaires du groupe des *Orthurethra* et une grande partie de ceux qui appartiennent au groupe des *Sigmurethra* sont holopodes.

La famille des *Pupillidae*, sa place dans le système et sa délimitation.

Les deux essais les plus récents et les plus étendus faits en vue de donner une exposition d'ensemble du système des Stylommatophores, sont dus à J. Thiele et H. Pilsbry. C'est à ce dernier que nous devons surtout beaucoup de reconnaissance pour le grand travail qu'il a poursuivi durant plusieurs années dans le but de remplir cette tâche difficile. Ses nombreux traités sont dispersés dans diverses revues, mais ses principales conclusions se trouvent dans l'œuvre monumentale, qui porte, il est vrai, le nom d'un autre, mais qui doit à lui seul son importance et son excellence, c'est-à-dire: Tryon, Manual of Conchology[51]). J. Thiele, qui est surtout un grand connaisseur de la radule des Gastéropodes, n'a fourni jusqu'à présent qu'une esquisse du système qu'il a créé,[75]) p. 147—161; cette esquisse donne cependant quelque idée d'un traité destiné à paraître dans «Handbuch der Zoologie», où le système sera sans doute exposé avec une quantité de détails, et qui sera extrêmement instructif, vu que la systématique a été élaborée suivant d'autres points de vue que le système de Pilsbry.

Comme celui-ci nous a été exposé par fragments et celui de Thiele sous forme de discussion, nous essayerons ici de reconstruire, au moins en partie, l'ensemble du système des Stylommatophores, d'après ce qui en existe dans la littérature malacologique. Il se peut cependant que les tableaux donnés ci-dessous ne répondent pas complètement à l'opinion des deux auteurs, mais je chercherai à m'en rapprocher autant que possible.

Le groupe *Ditremata*, avec les familles des *Onchidiidae*, des *Rathouisiidae* et des *Veronicellidae (Vaginulidae)*, a été classé autrefois dans les Stylommatophores; maintenant il est le plus souvent considéré comme formant un groupe spécial: les *Soleolifera* (Simroth), par opposition aux deux groupes (sous-ordres): les *Basommatophora* et les *Stylommatophora*, qui se réunissent sous le nom de *Lissopoda* (Simroth). Dans les tableaux suivants il n'est donc pas tenu compte des Soléolifères *(Ditremata)*.

Système de Pilsbry.*)

La classification en groupes principaux est basée sur la structure des organes palléaux, celle des subdivisions sur la structure de la mâchoire, de la radule et du pied (sans ou avec sillon péripédieux).

A. *Tracheopulmonata:* Fam. *Janellidae.*
B. *Vasopulmonata:*
  I. *Heterurethra (Elasmognatha):* Fam. *Succineidae.*
  II. *Orthurethra:* Fam. *Valloniidae, Enidae (Buliminidae), Pupillidae, Partulidae, Ferussacidae, Amastridae, Achatinellidae, Tornatellinidae.*
  III. *Sigmurethra.*
    1) *Holopoda:* Fam. *Clausiliidae, Megaspiridae, Cerionidae, Urocoptidae, Bulimulidae, Helicidae* (s. l.), *Acavidae, Achatinidae.*
      *Agnathomorpha***): Fam. *Aperidae, Rhytididae, Oleacinidae (Glandinidae), Streptaxidae, Circinariidae.*
    2) *Aulacopoda*: Fam. *Zonitidae* (avec plusieurs sous-familles), *Urocyclidae, Endodontidae, Phenacohelicidae, Limacidae, Parmacellidae, Arionidae, Philomycidae, Ostracolethidae.*
      *Agnatha***): Fam. *Testacellidae, Trigonochlamydidae* (avec *Plutoniinae).*

Système de Thiele.

Thiele effectue une division en groupes (*stirpes*, «Sippen»), mais il ne fait aucun essai pour réunir ceux-ci en divisions plus grandes, dans l'intention sans doute de pouvoir mieux démontrer, de cette manière, les relations et les affinités des groupes entre eux, plutôt qu'en les réunissant et les renfermant dans des cadres fixes.

1) *Tracheopulmonata*: *Athoracophoridae (Janellidae).*
2) *Succineacea: Succineidae.*
3) *Vertiginacea*: *Enidae, Vertiginidae, Valloniidae, Clausiliidae.*
4) *Achatinellacea*†): *Ferussaciidae, Tornatellinidae, Achatinellidae, Amastridae, Partulidae.*

*) Un des premiers résumés détaillés a été donné en 1900[49]), p. 563—64. Voir aussi 1910[51]), vol. XX, p. VII—VIII.

**) Pilsbry[51]), vol. XIX, p. VII. Ces deux groupes constituent ensemble l'ancien groupe *Agnatha*.

†) Chez Thiele aucun nom n'est indiqué pour ce «*stirps*».

5) *Cerionacea*: *Bulimulidae, Cerionidae, Urocoptidae, Megaspiridae.*
6) *Achatinacea: Achatinidae, Oleacinidae, Testacellidae.*
7) *Zonitacea*: *Zonitidae* (avec *Daudebardiinae*), *Endodontidae, Systrophiidae (Circinariidae), Trigonochlamydidae, Plutoniidae.*
8) *Acavacea: Acavidae, Ariophantidae, Urocyclidae, Paryphantidae (Rhytididae), Streptaxidae, Aperidae.*
9) *Helicacea: Sagdidae, Polygyridae, Camaenidae, Corillidae(?), Eulotidae, Helicidae.*
10) *Arionacea: Arionidae, Philomycidae.*
11) *Limacacea: Parmacellidae, Limacidae.*

En ce qui concerne la famille des *Pupillidae (Vertiginidae)*, les deux auteurs sont d'accord pour la rattacher étroitement à celle des *Enidae*. Ils ont été amenés à ce résultat par les recherches de Wiegmann, entre autres. Cet auteur a souligné plusieurs fois (par exemple dans le travail [86]), p. 248, dans la note) l'affinité intime de ces deux groupes (familles). Le fait que la famille des *Valloniidae* soit aussi en relation étroite avec les *Pupillidae* se trouve exprimé tant chez Thiele que chez Pilsbry; ce dernier a même rangé parmi les Pupillidae un des membres de cette famille: l'*Acanthinula* [51]), vol. 24, p. X.

Cependant, l'accord cesse par là. Thiele ne reconnaît pas la division basée sur la structure du rein, ce qui a comme conséquence que la famille des *Clausiliidae*, qui est sigmurethrique, est rangée dans le groupe des *Vertiginacea*, et que les *Orthurethra* de Pilsbry se répartissent dans les deux groupes: *Vertiginacea* et *Achatinellacea*; cette dernière circonstance n'a cependant pas beaucoup d'importance, vu que Thiele reconnaît, selon toute vraisemblance, une certaine parenté entre les deux groupes.

Pour pouvoir juger de la place occupée dans le système par la famille des *Pupillidae*, il importe, bien entendu, de savoir comment il faut la délimiter. Si on consulte le chef-d'œuvre systématique de la seconde moitié du siècle dernier: Poul Fischer, *Manuel de Conchyliologie*, 1887 [16]), p. 478—486, pour voir de quels genres se compose la famille des *Pupidae*, on découvrira qu'elle en comprend plusieurs qui maintenant sont classés avec certitude dans d'autres familles: les *Zospeum* sont des Basommatophores; les genres *Anostoma* et *Odontostomus* appartiennent à la famille des *Bulimulidae*, le *Coeliaxis* et le *Perrieria* à celle des *Achatini-*

dae, et les genres *Holospira* et *Eucalodium* se rangent dans la famille des *Urocoptidae (Cylindrellidae).* En outre un certain nombre de genres ont été séparés des autres comme formant des familles particulières: Les genres *Balea* et *Clausilia* constituent la famille des *Clausiliidae*, le genre *Strophia (Cerion)*, celle des *Cerionidae*, le *Megaspira*, celle des *Megaspiridae*, et le *Buliminus (Ena)* enfin représente la famille des *Enidae*. C'est à Pilsbry qu'appartient principalement le mérite d'avoir entrepris une grande partie de ce travail de classement.

Restent les genres *Hypselostoma*, *Boysia*, et *Pupa* avec les sous-genres: *Torquilla* (plutôt identique aux genres *Chondrina* et *Abida*), *Scopelophila (= Odontocyclas)*, *Pupilla*, *Sphyradium* (= un des sous-genres de l'*Orcula*) et *Leucochila (= Pupoides)*; en outre *Vertigo* avec le sous-genre *Isthmia* (= *Columella* + *Truncatellina*).

Bien que dans plusieurs manuels (par ex. dans Ray Lankester, *A Treatise on Zoology*) le système de Fischer soit encore conservé, on peut toutefois regarder comme incontestable que le malacologiste du début de notre siècle considérait la collection susmentionnée de genres comme l'ensemble de la famille des *Pupidae (Pupillidae ou Vertiginidae)*, avec la seule modification que les sous-genres ont été érigés en genres, et que quelques-uns des anciens genres ont été partagés.

Quand la présente étude a été commencée, le plan des examens fut fixé conformément à ces limites. Comme Pilsbry, dans son travail inachevé sur la famille des *Pupillidae*, y place le genre *Acanthinula*, et comme j'avais fait antérieurement de celui-ci (ainsi que du genre *Vallonia)* l'objet d'un examen[65]), j'y ajoutai, comme supplément, une espèce divergente, l'*Acanthinula harpa*.

Les limites assignées par Pilsbry[51]), vol. 24, p. X, — provisoirement, il est vrai, — à l'étendue de la famille des *Pupillidae*, et auxquelles il est référé plus haut, sont les suivantes:

Fam. *Pupillidae* Turton.

Gastrocoptinae: *Gastrocopta, Hypselostoma, Abida.*
Pupillinae: Pupilla, Pupoides.
Pagodininae: *Pagodina, Aspasita.*
Acanthinulinae: Acanthinula.

Vertigininae: Vertigo, Nesopupa, Truncatellina.
Orculinae: Orcula, Lauria.
Strobilopsinae: Strobilops.

Les seuls éléments nouveaux — ou *étrangers* — qui ont été ajoutés, sont les genres *Aspasita* et *Strobilops (Strobila),* qui autrefois ont été considérés comme des Hélicides ou qui ont été rangés ailleurs.

La raison pour laquelle Pilsbry a admis parmi les Maillots les genres *Aspasita* et *Acanthinula,* est certainement la publication[25]), faite par Hesse, des dessins posthumes de Wiegmann, représentant les organes génitaux et la mâchoire de l'*Acanthinula aculeata,* ainsi que les recherches de Hesse lui-même sur l'*Aspasita triaria**), qu'il place dans la famille des *Pupidae* ou des *Buliminidae.*

Peu de temps après, Hesse[26]) publie une autre des recherches posthumes de Wiegmann, à savoir l'anatomie du *Pyramidula rupestris* Drap., qu'il rapporte de même à la famille des *Pupidae (Pupillidae).*

Germain[17]), p. 190, Boycott[12, 13]) et Steenberg[65]) classent également le genre *Acanthinula* dans la famille des *Pupillidae* ou dans son voisinage immédiat.

Watson[80]) a enfin augmenté tout récemment le nombre des genres dont se compose la famille en question, en y ajoutant, non seulement les genres *Acanthinula*, *Vallonia* et *Pyramidula*, mais aussi celui de *Patulastra (Patulastra balmei* P. et M.). Watson admet la division «*Orthurethra*» de Pilsbry, et pense que la parenté entre les différents groupes qu'elle comprend (les *Cochlicopidae*, les *Amastridae*, les *Enidae* paléarctiques et les *Pupillidae*) est si étroite qu'ils devaient former une grande famille dont les groupes indiqués représentaient les sous-familles.

Avant de pouvoir juger ces conceptions assez divergentes des conditions systématiques, il faut cependant analyser le noyau principal qui forme le centre proprement dit de la famille, pour voir s'il constitue une unité autour de laquelle peuvent se grouper les genres nouveaux. C'est cette analyse qui a été le but du présent ouvrage. Les résultats auxquels nous ont amené les

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*) En 1914 déjà, Sturany et Wagner[72]), p. 49, ont rapporté le genre *Aspasita* aux *Pupidae*; cette classification était due seulement aux caractères de la coquille.

examens particuliers des chapitres précédents, prouvent que ce noyau n'est aucunement homogène, mais qu'il est, au contraire, considérablement hétérogène.

Le tableau de Pilsbry montre que son auteur a déjà remarqué cette circonstance; c'est ce que prouve sa division provisoire de la famille en sous-familles, où les caractères de la coquille ont joué sans doute le plus grand rôle, et bien que mes résultats ne s'accordent pas toujours avec les siens, on ne peut s'empêcher cependant d'apprécier chez lui le coup d'œil sûr et expérimenté qui sait découvrir la systématique des Pulmonés.

Dans ce qui suit, la parenté entre les différents genres des *Pupillidae* sera soumise à une analyse plus détaillée. Je me suis servi, dans ce but, des descriptions et des figures données dans les chapitres précédents, et aussi des études récentes parues dans la littérature malacologique.

Le groupe des *Chondrina*.

A en juger d'après la structure des organes génitaux, les genres *Chondrina*, *Abida* et *Sandahlia* se rattachent étroitement l'un à l'autre.

La glande hermaphrodite est assez compacte, bien qu'elle puisse être divisée en faisceaux par une préparation plus minutieuse. La section femelle du spermoviducte apparaît comme très développée, et forme, dans sa partie supérieure, de forts replis dont les angles sont alternativement saillants et rentrants. La prostate parcourt comme un ruban presque toute la longueur du spermoviducte. Le cul-de-sac de l'oviducte est long et bien développé. Le vagin et l'oviducte libre sont également longs. La poche copulatrice est fortement développée, avec un long pédoncule, qui ne porte pas de diverticule, mais dont la base est considérablement dilatée. Le pénis forme une simple fronde se composant d'une partie pénienne et d'un épiphallus, sur la limite desquels s'observe quelquefois un cul de-sac appelé «*flagellum*». Le rétracteur pénien se fixe à peu près au milieu de la section pénienne, mais se continue souvent jusqu'à l'épiphallus, les deux parties étant réunies par des muscles. Le système rétracteur de la tête est en relation intime avec le pénis et le cloaque génital.

La mâchoire a la forme d'un croissant, avec une légère saillie médiane, et de fines raies verticales. Ce n'est que dans la radule que des différences se remarquent; elles ne sont cependant pas grandes, et il existe, sous ce rapport, une transition nette entre les trois genres mentionnés. Les divergences de structure dans la radule, et les caractères de la coquille justifient donc seuls un classement séparé.

Le genre *Sandahlia* possède une coquille très caractéristique, semblable à celle de l'*Orcula*, mais à ombilic distinct et à columelle grosse et creuse. Les plaques basilaires des dents rachiales et des dents latérales intérieures sont carrées. La dent rachiale porte de fines cuspides latérales, et les dents latérales présentent un ectocone très fort. Les *Sandahlia* doivent constituer un genre à part, uniquement à cause de la structure de la coquille. Pilsbry les a placés déjà près de l'*Abida*, genre avec lequel s'accordent aussi la disposition et la structure des dents de l'ouverture de la coquille.

Les deux genres restants, l'*Abida* et le *Chondrina*, se distinguent un peu l'un de l'autre, mais pas beaucoup pour ce qui concerne la radule; les plaques basilaires sont un peu plus longues chez les *Chondrina* que chez les *Abida*, et le premier genre n'offre pas de cuspides latérales sur les dents rachiales et pas d'ectocone sur la plupart des latérales, au moins dans le groupe typique dont le *C. avenacea* est le représentant; le sous-genre *Solatopupa (C. similis)* a cependant, sur les dents rachiales, de légers commencements de pointes latérales, de même qu'il présente un ectocone sur un assez grand nombre de dents latérales. Il existe une dissemblance dans la coquille, en partie par sa matière, qui est brune chez les *Chondrina*, pâle et plus calcaire chez les *Abida*, en partie par l'aspect des dents de l'ouverture; les plis palataux sont plus longs chez les *Abida* que chez les *Chondrina*, et souvent élargis à leur extrémité intérieure, de sorte qu'ils forment comme une barrière interne; cependant c'est par là que le *Chondrina similis* constitue aussi une forme de transition, sa coquille étant calcaire, blanchâtre et opaque. Les deux genres ont été antérieurement réunis (sous le nom de genre «*Torquilla*»), et l'anatomie des parties molles témoigne en faveur du maintien de cette classification. Vu la dissemblance des radules, et vu surtout la différence de structure et d'aspect de la coquille, on peut toutefois soutenir l'opinion qu'elles sont distinctes et forment deux genres particuliers.

Le groupe des *Orcula*.

Le genre *Orcula* est apparenté au groupe précédent, les spermoviductes étant construits en principe de la même manière; toutefois le cul-de-sac de l'oviducte a ici un aspect particulier; il forme une poche plus courte, qui est large, blanchâtre et à parois minces. La glande hermaphrodite comprend des acini allongés, réunis en faisceaux. La poche copulatrice est extrêmement développée. Le pénis porte un appendice proximal grand, il est vrai, mais dépourvu du prolongement en forme de massue qui se trouve chez les deux groupes suivants. Le rétracteur pénien se fixe auprès de la base de l'appendice. L'épiphallus est bien développé. Le rétracteur de l'ommatophore et celui du petit tentacule ne se rattachent pas au pénis.

La mâchoire est demi-circulaire, large, aux extrémités arrondies, et finement striée dans le sens vertical. Les dents rachiales de la radule présentent trois cuspides, les latérales deux, bien distinctes, tandis que les marginales en possèdent plusieurs.

Les deux espèces d'*Orcula* décrites par Wiegmann et Hesse: *O. batumensis* Ret. et *O. orientalis* (Parr.) Pfr., diffèrent en plusieurs points de l'*O. dolium*. Elles ont toutes deux, à la base du pénis, un appendice distal très développé (appelé par les deux auteurs *appendix**) ou *appendicula*), et en outre, à l'attache du rétracteur pénien, un diverticule vigoureux (appelé *caecum*), de même que la poche copulatrice est considérablement plus courte que chez l'*Orcula dolium*. Un appendice distal, comme celui qui se trouve décrit chez les deux auteurs, ne s'aperçoit chez aucun des *Pupillidae* étudiés**); c'est un trait de structure si particulier, qu'il est impossible, en tout cas, que les deux espèces soient rangées dans le même genre que les *Orcula dolium* et *O. doliolum*. On propose, par conséquent, de donner aux deux espèces examinées par Wiegmann un nom de genre nouveau: *Orculella* (dont le type serait représenté par l'*Orcula orientalis* Pfr.). Peut-être faudra-t-il, après un examen plus détaillé, leur donner une autre place dans le système. Probablement faut-il joindre aussi au groupe des *Orcula* le genre *Pagodulina*.

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* Il est à remarquer que le nom *appendix* s'applique, chez Wiegmann-Hesse et chez moi, à deux appendices péniens différents.

**) Un appendice semblable n'a été observé que deux fois: chez un individu anormal du *Vallonia costata* [80]), p. 16, pl. II, fig. 5, et chez un exemplaire de l'*Ena detrita* [2]), p. 230, fig. 23 du texte.

Moquin-Tandon [11]), p. 389—90, donne une courte description des organes génitaux et une figure du pénis (pl. 27, fig. 37) chez le *Pupa pagodula* (identique au *Pagodulina p.*), par laquelle on voit qu'il existe un appendice pénien proximal, au lieu de naissance duquel se rattache un rétracteur vigoureux. On y constate également une section épiphalienne très développée (correspondante aux parties p_1—p_4 chez l'*Orcula*; pl. VIII, fig. 1). Que la bande indiquée dans la figure de Moquin-Tandon par *h'* et appelée muscle, corresponde à la bande conjonctive de l'*Orcula* (pl. VIII, fig. 1, x, de la présente étude), c'est ce qui est peut-être douteux. Un autre point de ressemblance est la poche copulatrice très fortement développée, dont le plus grand diamètre est, suivant Moquin-Tandon, 1 mm, c'est-à-dire les trois quarts de la longueur de l'appendice pénien. Pilsbry a rapproché l'*Aspasita (= Spelaeodiscus)* du genre *Pagodina (= Pagodulina)*; ils ne sont cependant pas aussi étroitement apparentés que le *Pagodulina* et l'*Orcula*, à en juger d'après les renseignements assez incomplets, il est vrai, qui existent sur les trois formes.

Le groupe des *Pupilla*.

Les espèces étudiées du genre *Pupilla* sont intimement apparentées. Elles offrent les traits communs suivants: La glande hermaphrodite est petite, comprenant un seul faisceau, ou deux, indistinctement séparés; les acini sont petits et peu nombreux. La prostate ne se compose que d'un petit nombre d'acini, réunis en une partie piriforme située tout en haut, à l'extrémité supérieure de l'oviducte, auprès de la glande albuminipare. Il n'existe pas de cul-de-sac de l'oviducte. Toute la section femelle du spermoviducte est transformée en un utérus à parois minces. La poche copulatrice est assez courte, divisée à l'extrémité en deux branches (c.-à.-d. qu'elle est munie d'un diverticule), dont l'une forme un prolongement tubulaire du pédoncule, l'autre une vésicule latérale. Le pénis offre une partie distale, et un épiphallus; sur la limite entre ces deux s'observe un cul-de-sac tout court (diverticule ou *flagellum*); au milieu de la partie distale prend naissance un appendice très grand et très complexe, se composant de trois sections dont l'extérieure a la forme d'une massue à long pédoncule. Le rétracteur pénien est bifurqué; l'une des ramifications se rattache à la partie intérieure de l'appendice, l'autre, qui est très courte,

s'insère sur l'épiphallus. Les rétracteurs de la tête n'ont aucune relation avec le pénis.

La mâchoire porte une légère saillie médiane, ses extrémités sont arrondies, et à la surface se voient quelques lignes, bien accentuées, indiquant que cette pièce est composée d'un système de larges plaques soudées. La radule présente des dents rachiales carrées, à trois cuspides distinctes, des dents latérales à deux cuspides, et d'autres marginales en forme de peigne à plusieurs pointes.

Le groupe des *Lauria.*

Pour ce qui concerne le pénis, ce groupe ressemble beaucoup au précédent. Ici se constatent de même un appendice très considérable en trois sections, à la région basilaire duquel se rattache l'une des branches du rétracteur, et un diverticule *(flagellum)* partant de la partie proximale du pénis; ce diverticule est cependant beaucoup plus grand que chez les *Pupilla*, et la seconde branche du rétracteur pénien se fixe entre les deux appendices *(appendix* et *flagellum)*, et non pas, comme chez le genre *Pupilla*, à la partie épiphallienne située du côté proximal du *flagellum.* Il existe encore d'autres points d'analogie. La prostate est courte, triangulaire, située auprès de la glande albuminipare, et l'animal est ovovivipare. Mais là cesse la ressemblance. Les *Lauria* présentent une série de particularités spéciales: l'utérus est formé uniquement par l'oviducte libre, qui est considérablement développé, et le canal déférent est, par conséquent, très long. Le spermoviducte est en revanche extrêmement court. Il n'existe pas de cul-de-sac de l'oviducte. La structure interne du spermoviducte est comme chez la famille des *Clausiliidae.* La poche copulatrice est munie d'un long pédoncule, mais n'offre pas de diverticule. Les rétracteurs de la tête n'ont aucune relation avec le pénis. La mâchoire et la radule ressemblent beaucoup à celles du genre *Pupilla.*

D'après ce que nous venons de dire, les deux groupes: *Pupilla* et *Lauria* sont intimement liés. Germain[17]), guidé évidemment par les seuls caractères de la coquille, fait du *Lauria* un sous-genre du *Pupilla.*

Le groupe des *Nesopupa.*

Aux deux groupes précédents se rattache encore le genre *Nesopupa*, dont l'organe copulateur mâle rappelle beaucoup le leur, tan-

dis que le reste des conduits génitaux ressemble tout à fait à ceux du genre *Vertigo*. Le pénis porte un grand appendice auquel se fixe l'une des branches du rétracteur pénien; mais cet appendice a la forme d'une simple massue. A l'extrémité de la partie proximale du pénis (épiphallus), tout près du lieu d'accès du canal déférent, s'insère la seconde branche du rétracteur pénien. Le rétracteur de la tête est sans relation avec le pénis. La section femelle du spermoviducte est simple, sacculiforme. La poche copulatrice manque de diverticule, selon toute vraisemblance. La glande hermaphrodite se compose d'un très petit nombre d'acini, grands et presque globulaires. Le nombre de replis du canal hermaphrodite est assez restreint.

La mâchoire n'est composée que de quelques plaques assez larges, entre lesquelles s'aperçoivent des sillons clairs (comme chez les *Vertigo*). Les dents rachiales de la radule présentent des plaques basilaires carrées, et portent trois cuspides; les dents latérales ont des plaques basilaires de la même forme, leur mésocone est grand, l'ectocone un peu plus court et l'entocone extrêmement court. Les dents marginales sont en forme de peigne. Toutes les dents portent, comme chez les *Vertigo*, des pointes accessoires bien développées.

Les *Nesopupa* forment la transition au

Groupe des *Vertigo*.

Celui-ci est caractérisé par les traits suivants: Une glande hermaphrodite divisée en deux faisceaux et composée de grands acini courts, souvent presque globulaires, un canal hermaphrodite peu tortueux, une grande glande albuminipare, et un oviducte simple, en forme de sac, souvent très court; l'oviducte libre est long, sans cul-de-sac, mais présente le plus fréquemment un renflement d'une conformation histologique particulière, qui est peut-être à considérer comme un cul-de-sac rudimentaire de l'oviducte. La poche copulatrice est bien développée, à pédoncule long et mince. Le pénis est de structure très simple, sans appendice d'aucune sorte, partagé souvent en une moitié distale, plus vigoureuse, qui représente la section pénienne proprement dite, et une moitié proximale plus courte: l'épiphallus, qui est quelquefois nettement séparé de la distale. Le rétracteur pénien non ramifié se rattache à la partie proximale de l'épiphallus, près de l'endroit où s'ouvre dans

celui-ci le canal déférent. Ce dernier est long. Il n'existe pas de relation entre les rétracteurs de la tête et les organes génitaux.

La mâchoire est constituée par un petit nombre de larges plaques soudées l'une à l'autre, et séparées par des sillons clairs, assez larges. La radule est très particulière, portant souvent des dents qui, en général, ressemblent toutes à des tridents avec des pointes accessoires bien distinctes.

La paire inférieure de tentacules fait défaut.

Le groupe des *Truncatellina*.

Ce groupe comprend les genres *Truncatellina* et *Columella*.

Ils ont comme caractère commun la glande hermaphrodite divisée en deux faisceaux, et composée d'acini assez courts, globulaires ou piriformes. La section femelle du spermoviducte est fortement plissée, d'une consistance claire et gélatineuse. L'oviducte libre paraît extrêmement court, ou même fait complètement défaut. En effet, le canal déférent saillit à un point situé si loin du côté distal qu'il se forme, entre l'oviducte gélatineux proprement dit et le lieu de naissance du canal déférent, une partie qui, à en juger par sa consistance (chez le genre *Columella*), ou (chez les *Truncatellina*) par le parcours qu'y suit le canal déférent, est à considérer comme appartenant à l'oviducte libre, dont elle représente par conséquent la région proximale. La poche copulatrice est bien développée, mais à pédoncule court et sans diverticule. Le pénis est simple, sans appendice et sans flagellum (tout au plus présente-t-il, chez le genre *Columella*, une faible trace de cul-de-sac). Le rétracteur de la tête n'est pas en relation avec les organes génitaux. Les *Truncatellina* offrent un pénis droit ou courbé à l'extrémité en forme de crochet, et sans épiphallus proprement dit; le rétracteur se fixe à l'extrémité pénienne proximale. Le genre *Columella* possède un épiphallus étroit, au milieu duquel se rattache le rétracteur; cette partie épiphallienne ne débouche pas à l'extrémité apicale de la région pénienne en forme de sac, mais sur le côté de celle-ci, de sorte que la partie apicale forme comme un petit cul-de-sac.

Les mâchoires des deux genres sont à peu près identiques, avec un petit nombre de raies verticales, et composées, par con-

séquent, de plaques assez larges. Radule: Les dents rachiales ont trois cuspides, les latérales, deux principales, le mésocone et l'ectocone, qui sont de la même grandeur ou à peu près, et en outre des pointes accessoires bien développées; les dents marginales sont peu nombreuses, irrégulières et à plusieurs cuspides. Chez les *Truncatellina* les dents rachiales et les dents marginales intérieures ont des plaques basilaires carrées, chez les *Columella*, au contraire, ces plaques sont plus allongées.

A cause de la ressemblance dans la structure de la glande hermaphrodite, du pénis, de la mâchoire et de la radule (développement de pointes accessoires), les groupes des *Vertigo* et des *Truncatellina* doivent être étroitement rattachés l'un à l'autre. La division (famille) qu'arrivent à former ainsi les deux groupes réunis, doit comprendre en outre celui des *Nesopupa*, plus éloignés.

Le classement du genre *Columella* Westl. a connu diverses phases. Jusqu'en 1896 on le considérait comme appartenant à la famille des *Pupidae*. Sterki[68]), p. 75, examina alors la mâchoire et la radule et remarqua que cette dernière, qui était assez spéciale, rappelait plutôt le genre *Punctum*, étant donné qu'il ne connaissait évidemment pas la radule du *Truncatellina*. Il était aussi d'avis que la mâchoire ressemblait également à celle du *Punctum*. Depuis cette époque, le genre a été rapporté à la famille des *Endodontidae* (sous-famille *Punctinae* vel *Polyplacognatha*[48]), p. 142). Hanna, 1912[22]), étudia cependant le rein, les organes génitaux et l'aspect de l'animal, et arriva à cette conclusion que le genre faisait certainement partie des *Pupillidae*, et qu'il était étroitement apparenté avec les *Vertigo*, conclusion qui, par conséquent, s'accorde à peu près avec la place qui lui a été assignée dans la présente étude. Le nom qui autrefois lui était généralement donné était celui de *Sphyradium* (Ag.) Charp. Pilsbry[50]), p. 60, démontra que cette appellation est employée ailleurs dans le règne animal, et il adopta le nom de *Columella* dont se sert Westerlund. Les dénominations de *Coryna* Westl. et *Agardhia* Gude ont également été en usage, mais cette dernière (le nom de *Coryna* est préoccupé) doit être réservée à un autre groupe, dont le type est représenté par le *Pupa ferrari* Porro.

Le groupe des *Vallonia*.

Celui-ci comprend les genres *Vallonia*, *Acanthinula* et peut-être aussi celui de *Pyramidula* s. str.*) Ces genres sont assez divergents, — au premier coup d'œil, en tout cas —, ce qui est dû à la circonstance que plusieurs des formes sont souvent — quelques unes même toujours — dépourvues d'appareil copulateur mâle, qui, on le sait, est un des principaux caractères servant à déterminer les conditions d'affinités; chez une des espèces, l'*Acanthinula harpa*, le conduit d'excrétion femelle est, en outre, extrêmement modifié, l'oviducte étant transformé en utérus. Il n'existe, par conséquent, dans les organes génitaux, qu'un petit nombre de traits qui sont communs à toutes les espèces des trois genres.

L'orifice génital, au moins chez les genres *Vallonia* et *Acanthinula*, ne se trouve pas à l'endroit ordinaire, un peu en arrière et au-dessous de l'ommatophore droit, mais très en arrière, à mi-chemin entre le pneumostome et l'ommatophore, quelquefois plus rapproché du premier. Soós[62]), p. 160, déclare pour le *Pyramidula rupestris:* «Die Genitalöffnung liegt sehr tief, in der Nähe des Fusses».

La glande hermaphrodite comprend 1, 2 ou 3 faisceaux, dont chacun ne renferme que quelques acini courts. La prostate est petite et ne s'observe que dans la partie proximale, auprès de la glande albuminipare; c'est chez les formes ovovivipares, *Acanthinula harpa* et *Pyramidula rupestris*, qu'elle est le moins développée. Chez toutes les espèces qui possèdent un pénis, celui-ci porte un appendice, qui, chez l'*Acanthinula aculeata* et les *Vallonia*, est fortement développé, et seulement rudimentaire chez le genre *Pyramidula*. Chez l'espèce d'*Acanthinula* mentionnée on constate quelquefois des diverticules sur la limite entre les régions péniennes distale et proximale (épiphallus). Chez les formes où l'appendice est bien développé, le rétracteur pénien a deux branches, dont l'une se rattache à l'appendice, tandis que l'autre s'insère plus loin du côté proximal, sur l'épiphallus ou sur un diverticule. La poche copulatrice a

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*) Le *Pyramidula rupestris* Drap. a été dernièrement examiné au point de vue anatomique par Soós[62]), p. 114—116, 160, Wiegmann-Hesse[26]), p. 110—117, et par Watson[80]), p. 6—30.

le pédoncule assez court et ne présente en général pas de diverticule; cependant, l'espèce *Acanthinula harpa* en a le plus souvent un, tout court.

La mâchoire se compose d'assez larges plaques, finement striées, tant dans le sens vertical que concentrique; le bord tranchant est irrégulièrement denté, avec ou sans une saillie médiane.

La radule a assez peu de dents latérales et marginales. La formule en est: (13 à 17)—1—(13 à 17). La dent rachiale porte trois cuspides, et sa plaque basilaire est plus petite et plus étroite que celle de la première dent latérale. Chez les espèces du genre *Vallonia**) et chez l'*Acanthinula aculeata* cette différence est très frappante. Le *Pyramidula* seul y fait exception; ce genre est aussi remarquable par ses cuspides très larges et obtuses. Les dents latérales portent deux cuspides, les marginales sont en forme de peigne, à plusieurs pointes.

Le genre *Pyramidula* s. str. (qui ne comprend provisoirement que l'espèce *P. rupestris*) et les *Vallonia* représentent sans aucun doute des genres bien délimités, tant pour ce qui est des parties molles que pour la coquille, et les espèces du *Vallonia* sont de nature assez homogène. Il n'en est pas ainsi des trois espèces étudiées, qui, jusqu'à présent, ont été classées dans le genre *Acanthinula*; chacune d'elles a son caractère particulier, aussi bien pour la coquille que pour la radule et pour les parties molles. Si on ne réussit pas à trouver des exemplaires appartenant aux espèces *A. lamellata* et *harpa* pourvus d'un pénis dont la structure corresponde à celle de l'*A. aculeata*, il faut plutôt considérer les trois espèces comme faisant partie de trois genres différents, auxquels il faut donc appliquer les noms de genres suivants:

1º *Acanthinula* Beck s. str., pour *A. aculeata.* Pénis avec appendice et deux diverticules. La dent rachiale beaucoup plus petite que la première dent latérale. Uretère secondaire développé le long du primaire.

2º *Spermodea* Westerlund, pour *A. lamellata.* Pas de pénis. La dent rachiale pas beaucoup plus petite que la première dent latérale. Comme dans les trois derniers groupes, il existe une pointe

*) Pollonera [52]), p. 109, a remarqué ce caractère, sur lequel il s'est basé, ainsi que sur la structure des organes génitaux, pour séparer le genre *Vallonia* des *Helicidae* et le rattacher aux *Pupidae* (*Pupillidae*).

accessoire entre le mésocone et l'ectocone des dents latérales. Pas d'uretère secondaire.

3⁰ *Zoogenetes* (ou *Zoogenites)* Morse, pour *A. harpa.* Pas de pénis. Utérus formé de tout l'oviducte et de la région supérieure de l'oviducte libre. Prostate très peu développée. La plaque basilaire de la dent rachiale n'est pas beaucoup plus petite que celle de la première dent latérale. Aucune des dents latérales ne porte de pointes accessoires. Pas d'uretère secondaire. A ces points de divergence s'ajoute encore la dissemblance des caractères de la coquille.

Au groupe des *Vallonia* se rattache peut-être encore le genre *Aspasita**) Westl. (*A. triaria* Rssm.); c'est une forme à coquille hélicoïdale, dont l'appareil génital rappelle beaucoup celui du *Vallonia*, et surtout celui de l'*Acanthinula* (s. str.). Il a été étudié par Hesse[25]), p. 58, et Soós[62]), p. 66, 147, fig. 41. On y constate un pénis bien développé, muni d'un appendice très vigoureux qui comprend une partie proximale et une autre distale en forme de massue et à long pédoncule; il existe de même un gros diverticule, semblable à un flagellum. Le rétracteur pénien est divisé en deux ramifications dont l'une se fixe à l'appendice, l'autre au diverticule. Le pédoncule de la poche copulatrice est court. La prostate se compose de grands follicules glandulaires, bien séparés; son étendue le long du spermoviducte est difficile à déterminer d'après la figure (Soós, fig. 41); il paraît toutefois qu'elle n'arrive pas à la région inférieure de celui-ci.

La mâchoire est fortement courbée, recouverte de sillons longitudinaux irrégulièrement disposés (comme chez le *Zoogenetes harpa*). Formule dentaire: (16 à 19)—1—(16 à 19). La dent rachiale est plus étroite que la dent latérale intérieure, avec une seule cuspide et de légères traces de pointes latérales. Les dents latérales ont deux cuspides; les marginales, en forme de peigne, en portent plusieurs. Aussi longtemps qu'un examen plus détaillé n'a pas été entrepris sur la conformation du spermoviducte et la structure interne du pénis, le genre trouve plutôt sa place dans le groupe des *Vallonia*. Hesse[25]), p. 58, le rapporte à la famille des *Buliminidae (Enidae)* ou à celle des *Pupidae (Pupillidae).* Soós[62]), p. 147, Sturany et Wagner[72]), p. 67—68, le classent sans aucune hési-

*) Selon Sturany et Wagner[72]), p. 67, et selon Hesse[26]), p. 119, plus correctement: *Spelaeodiscus* Brus.

tation dans la famille des *Pupidae* (*Pupillidae* s. lat.); les deux derniers auteurs pensent que pour ce qui concerne les caractères de la coquille, l'*Aspasita (Spelaeodiscus)* se rattache au *Pagodina* Stab. (= *Pagodulina* Cl.) et à l'*Orcula* Held. Pilsbry est du même avis [51]), vol. 24, p. X; il le réunit au genre *Pagodina* Stab. et en forme la sous-famille *Pagodininae*.*)

Le groupe des *Patulastra*.**)

L'espèce *Patulastra balmei* P. & M. a été examinée par Watson [80]), qui la rattache étroitement au groupe précédent et à la famille des *Pupillidae*, en reconnaissant toutefois qu'elle offre quelques traits primitifs à cause desquels il en fait, dans son tableau, une ramification de la branche principale, reliant les *Pupillidae* avec les autres genres du groupe des *Orthurethra*.

Pour ce qui concerne les organes génitaux, la prostate s'est développée le long de tout le spermoviducte. A en juger par la fig. 2, pl. I [80]), il semble qu'il existe peut-être un cul-de-sac de l'oviducte (la partie claire, allongée). La poche copulatrice est bien développée, sans diverticule. Le pénis forme une simple fronde sans appendice, ni diverticule, avec un rétracteur non ramifié. La partie distale, l'épiphallus, présente une structure particulière et un renflement. Dans la région pénienne distale s'aperçoit une papille. L'animal est ovovivipare. La mâchoire [80]), pl. I, fig. 5, [51]), vol. IX, p. 46, pl. 15, fig. 2, ressemble beaucoup à celle du genre *Vallonia*. La radule [80]), fig. 4 b et 4 c, offre une très petite dent rachiale à trois cuspides, de fortes dents latérales avec deux cuspides, et des dents marginales, dont les pointes sont arrondies et assez larges; ces dernières sont plus hautes du côté médial et diminuent peu à peu vers l'extérieur, ce qui leur donne l'air d'être placées obliquement. Il se constate plus de dents dans chaque rangée transversale que dans le groupe précédent. Formule dentaire: $125 \times (17-9-1-9-17)$.

Le genre est assez isolé; des points d'affinité ne peuvent se supposer qu'avec deux groupes, soit celui de *Chondrina*, duquel il

*) Doit être appelée maintenant *Pagodulininae*, vu que les noms de *Pagodina* Stab. et *Pagodula* Hesse sont déjà employés.

**) W. Wenz a donné à ce genre le nom de *Pleurodiscus* (Nachrichtsblatt 51. Jahrg., p. 78).

se rapproche par la prostate bien développée et par la fronde pénienne simple, sans appendice d'aucune sorte, soit celui d'*Ena*, qui possède une papille pénienne perforée et une prostate en forme de ruban. Deux genres de la famille des *Enidae: Mastus* et *Chondrula* ont un pénis simple, sans appendice, de même que, d'après Wiegmann[88]), p. 282, le diverticule de la poche copulatrice fait quelquefois défaut dans cette famille (chez le *Zebrina hohenackeri* Kryn., ainsi que chez des espèces du *Cerastus*). La forme de la coquille diffère cependant beaucoup de celles des deux groupes mentionnés *(Chondrina* et *Ena)*, de sorte qu'il faut plus vraisemblablement faire du genre en question un groupe particulier. Un examen de la structure de l'oviducte pourrait certainement trancher cette question, ou en tout cas rendrait plus facile de se former à ce sujet une opinion plus exacte.

Le groupe des *Strobilops*.

Le genre *Strobilops* Pilsbry (*Strobila* Morse) a été spécialement étudié par G. Dallas Hanna, 1922[23]), p. 91, pl. II, fig. 10 et 11. Au point de vue de la conformation de la coquille, c'est un groupe particulier qui, à présent, ne se rencontre qu'en Amérique, dans l'Asie orientale, au Japon et dans les îles Philippines (sous-genre *Enteroplax* Gude) mais qui autrefois a vécu en Europe, où on en retrouve des traces dans les couches tertiaires, depuis l'époque éocène.*) La coquille est basse, à peu près discoïdale, ou conique-globuleuse, avec de longues lamelles intérieures, pareilles à des cordons, situées sur les parois pariétale et columellaire ainsi que sur la base du dernier tour; ces lamelles portent de nombreuses et fines pointes et nodosités.

Les espèces de ce genre ont été autrefois rapportées aux familles des *Helicidae* ou des *Endodontidae*; Hanna a cependant démontré que la structure du rein est semblable à celle du groupe des *Orthurethra*; et comme le genre est en outre dépourvu de sillon pédieux et de glande caudale, c'est donc réellement dans ce groupe qu'il faut le ranger. Pilsbry[51]), vol. 24, p. X, l'a fait rentrer dans la famille des *Pupillidae*, comme représentant une

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*) W. Wenz, *Zur Kenntnis der Gattung Strobilops Pils.*, Nachrichtsblatt d. Deutsch. Mal. Ges., 48. Jahrg., 1916, p. 178.

sous-famille particulière: *Strobilopsinae;* Bryant Walker l'a placé dans cette même famille, tandis que Hanna, se fondant plutôt sur la structure de la coquille, en a fait une famille particulière: *Strobilopsidae.* D'après la description de la conformation des organes génitaux, donnée par ce dernier auteur, le groupe est apparenté aux *Vallonia.* Le pénis est à peu près analogue à celui de ce dernier groupe, avec un très grand appendice, un épiphallus bien développé et un rétracteur pénien bifurqué, dont l'une des branches se fixe à la base de l'appendice. La structure du spermoviducte ne se comprend pas bien par les descriptions et la figure. L'auteur décrit et reproduit une série de poches aplaties, placées en haut sur l'oviducte. Comme il ne fait pas mention de la prostate, on pourrait supposer que ces poches la représentent.

Toutefois, la mâchoire et la radule diffèrent des organes correspondants du groupe des *Vallonia* (Binney[4]), vol. V, p. 258—61, fig. 150; pl. V, fig. N, O). La dent rachiale est très vigoureuse, un peu plus large que la première dent latérale, et nettement terminée par trois cuspides; les dents latérales présentent deux cuspides, les marginales, plusieurs, dont l'intérieure est forte, fendue en deux à l'extrémité. La mâchoire porte des côtes larges et accentuées — dont le nombre est au moins 12, quelquefois un chiffre plus élevé —, et qui font saillie sur les deux bords.

Les *Strobilops* offrent une série de particularités dans la conformation des parties molles, ce qui, joint à la structure singulière de la coquille, leur assigne une place à part. Hanna décrit une glande accessoire sur la face intérieure, concave, de l'estomac; la forme de l'œsophage, plein de nodosités, dont parle le même auteur, est due peut-être à l'état fortement contracté de l'individu; l'indication singulière et invraisemblable que l'animal ne possède pas de cloaque génital, résulte sans doute de la même circonstance. Plus étonnant encore est cependant le renseignement d'après lequel le rétracteur pénien se réunirait au rétracteur de l'ommatophore droit; je suppose qu'il s'agit tout au plus d'une bande conjonctive qui les relie, ce qui serait déjà un cas unique dans le groupe des *Orthurethra.*

Vu ces nombreuses conditions particulières de structure, il semble préférable de se rallier à l'opinion de Hanna et de considérer le genre comme formant une famille à part.

Caractéristique des autres groupes des *Orthurethra* et leur affinité entre eux.

Pour mieux pouvoir comparer les groupes des *Pupillidae* décrits ci-dessus, avec les autres familles qui ont été rangées par Pilsbry dans les *Orthurethra*, nous donnerons dans ce qui suit, le plus souvent d'après les descriptions de cet auteur dans «*Tryon, Manual of Conchology*» [51]), un court aperçu anatomique de toutes ces familles, excepté celles d'*Enidae* et de *Cochlicopidae*. En ce qui concerne ces deux familles, nous nous sommes servi, outre nos propres recherches, de celle de Wiegmann [36, 88]), de Hesse [24]), et de Beck [2]) pour la première, et pour la dernière, avant tout des études de Wiegmann-Hesse [28]), mais aussi de celles de Boycott [14]).

Famille des *Enidae*.

Le canal hermaphrodite est muni dans sa partie proximale d'une foule de culs-de-sac tout petits, qui, d'après Wiegmann [88]), p. 283, semblent caractériser la famille. La prostate est bien développée, longue dans son ensemble et en forme de ruban, accompagnant tout le spermoviducte. Celui-ci apparaît comme nettement divisé en trois conduits (Beck [2]) p. 223), dont l'un plus grand, le canal muqueux, est situé d'un côté du canal séminal, et un autre plus petit, le canal séreux, s'aperçoit de l'autre côté, comme chez la famille des *Clausiliidae* (Steenberg [64])) et chez les *Lauria*. La poche copulatrice est fortement développée; le pédoncule est long, et, à quelques exceptions près, muni d'un diverticule. Le pénis est simple dans un petit groupe (certaines espèces des genres *Mastus* et *Chondrula*), tandis que dans un autre, plus nombreux, il porte un appendice bien développé et souvent extrêmement long, se composant de plusieurs parties (3—4). Chez quelques espèces, la section épiphallienne du pénis possède 1 ou 2 diverticules *(caecum* et *flagellum)*, situés plus du côté proximal. Sur la limite entre l'épiphallus et la partie pénienne proprement dite, cette dernière est dilatée et renferme une papille perforée. L'appendice en porte une pareille (Wiegmann [88]), p. 286—287; pl. XI, fig. 54, 55; Beck [2]), pl. 10, fig. 44), et son extrémité serait, d'après Wiegmann, une

glande; tout l'appareil est comparé avec la «Anhangsdrüse» des Vitrines, et Hesse[29]), p. 25, pense qu'il existe ici une véritable homologie.

Le rétracteur pénien se compose généralement de deux rétracteurs; l'un va au pénis lui-même et s'insère du côté distal de la région dilatée*) qui renferme la papille pénienne; l'autre, qui fait quelquefois défaut (par ex. chez le *Zebrina detrita* et chez quelques exemplaires de l'*Ena obscura*), se rattache à la partie basilaire de l'appendice. Les deux rétracteurs se fixent sur le diaphragme, soit indépendamment l'un de l'autre, soit en se rejoignant pour former un seul tronc.

Mâchoire aulacognathe, composée de plaques étroites, finement striées.

La radule est longue, souvent avec un grand nombre de dents dans chaque rangée transversale. Formule: (20 à 45)—1—(20 à 45). Les formes typiques ont une dent rachiale à trois cuspides, de la même taille que la dent latérale intérieure, ou en tout cas pas beaucoup plus petite; les dents latérales portent deux cuspides, et les marginales, plusieurs dont le mésocone, à mesure qu'on avance dans la rangée, reste longtemps beaucoup plus grand que les autres. Dans quelques groupes se remarque une tendance vers une structure plus simple des dents, la dent rachiale diminue et ses cuspides latérales, ainsi que l'ectocone des dents latérales médiales, disparaissent.

Wiegmann[36]), p. 84, fait remarquer que les Enides de l'Afrique méridionale (genre *Pachnodes* ou *Pachnodus*) diffèrent des autres, tant par leur aspect extérieur, que par la conformation des organes génitaux et de la radule, et qu'il faut les en séparer. Watson[80]), p. 23, se réfère de même à ces espèces, et estime qu'on doit les considérer comme une sous-famille particulière ou même comme une famille à part.

Dans les espèces du *Pachnodus*, les animaux ont le dessus du pied dentelé et en forme de carène. Le pénis est muni d'un appendice extrêmement développé, placé bien avant du côté distal, chez le *P. velutinus* Pfr. à peu près entre le vagin et le lieu d'accès

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*) Ceci a été relevé par Wiegmann comme étant une circonstance particulière.

du pénis dans le cloaque génital. La poche copulatrice ne présente pas de diverticule, et son pédoncule est extraordinairement court chez le *P. velutinus* Pfr., tandis qu'il est de longueur moyenne chez le *P. spiraxis* Pilsb. (Pilsbry[51a]), fig.155). Les petits culs-de-sac de la partie proximale du canal hermaphrodite, si caractéristiques pour les *Enidae*, font ici défaut. C'est cependant la radule qui est le plus caractéristique. Les rangées transversales ne forment pas, comme chez les autres *Enidae*, un arc d'arbalète assez régulier, mais se courbent à trois endroits, de façon qu'une ligne qui suit une de ces rangées forme le même dessin que le contour de la coupe verticale d'un volcan; la première dent latérale est, en effet, très grande et fortement saillante, et la dent rachiale relativement petite, à 1—3 cuspides. Les dents marginales ont un aspect spécial, assez particulier; les plaques basilaires sont étroites, placées obliquement, les plaques dentaires en forme de peigne à plusieurs pointes. Le nombre de dents de la rangée transversale est considérablement plus grand que chez les *Enidae* mentionnés plus haut. La formule dentaire est, selon Wiegmann: (187 à 196)—1—(187 à 196); Schacko[54a]), pag. 338, donne pour le *P. velutinus* Pfr. un nombre encore plus grand: 158 × (190—13—1—13—190). La différence entre ce genre et les autres *Enidae* est donc si importante qu'il faut se rallier sans doute à Watson et y voir un groupe particulier: le groupe des *Pachnodus*.

Famille des *Cochlicopidae* (s. lat.).

Dans sa monographie de la famille des *Ferussacidae* Bourg., Pilsbry[51]), vol. XIX, p. 211—215, divise celle-ci en deux groupes, dont l'un présente un sillon pédieux et le plus souvent un pore caudal, ainsi qu'un pénis simple, sans appendice, tandis que les individus de l'autre possèdent un rein orthurethrique*) et un appendice pénien, mais manquent de sillon pédieux et de glande caudale.

*) La figure de Pilsbry représentant le rein chez le *Cochlicopa lubrica* Müll. (l. c., p. 213) ne s'accorde pas avec la description de Wiegmann[28]), p. 50. Comme Pilsbry possède des connaissances particulièrement profondes sur la structure de cet organe, je me suis conformé aux indications de cet auteur. Pour les *Ferussaciinae* le rein n'a pas été examiné, mais la structure du pied, ainsi que d'autres caractères, portent à croire que cette section n'appartient pas au groupe des *Orthurethra*.

Les deux groupes correspondent, pour les traits essentiels, aux sous-familles: *Ferussaciinae* et *Cochlicopinae* de Hesse[28]), p 70.

Ces deux sous-familles sont si différentes qu'elles doivent être séparées, et la dernière seule appartient aux *Orthurethra.* Watson[80]) (p. 24) va encore plus loin et voudrait séparer aussi le genre *Cochlicopa* Risso et le genre *Azeca* Turt. pour faire de ce dernier une nouvelle sous-famille. Dans le travail de Hesse[28]), paru postérieurement à celui de Watson, se trouvent publiées quelques recherches très détaillées, faites par Wiegmann, qui démontrent qu'une étroite affinité existe entre ces deux genres, qui, par conséquent, doivent continuer à faire partie du même groupe.

Les genres *Azeca* Turt., *Cochlicopa* Risso et probablement aussi celui de *Spelaeoconcha* Stur. forment donc, suivant l'opinion de Hesse, une sous-famille, ou bien, si on la coordonne aves les *Enidae*, une famille:

Cochlicopidae (s. str.).

Cette famille peut être caractérisée (selon mes propres recherches et celles de Wiegmann) de la manière suivante:

Les organes génitaux comprennent une glande albuminipare le plus souvent petite, mais une prostate bien développée, en forme de ruban, et composée d'acini longs et relativement grands, situés transversalement le long de l'oviducte large, plissé et gélatineux.*) Le pédoncule de la poche copulatrice est de longueur moyenne, avec diverticule *(Cochlicopa)*, ou sans *(Azeca)*. Le pénis comprend une partie pénienne proprement dite, du côté distal, et une proximale: l'épiphallus; sur la limite entre ces deux se voit un diverticule *(appendix)*, qui est court, chez les *Azeca* tandis que, chez les *Cochlicopa*, il est très long et composé de deux sections. Un rétracteur non ramifié se fixe au pénis tout près de la base de l'appendice, du côté proximal.

La mâchoire a la forme d'un croissant, aux extrémités arrondies, couverte de fines stries verticales, comme si elle était composée de plaques étroites; le bord tranchant est égal ou finement dentelé. La dent rachiale de la radule, à trois cuspides, est con-

*) L'appendice que Boycott[14]) a constaté à l'extrémité supérieure de l'oviducte libre (chez *Azeca*) est probablement de la même nature que le cul-de-sac de l'oviducte qui s'observe chez le groupe des *Chondrina*.

sidérablement plus petite que les latérales, et sa plaque basilaire est étroite. Celles des latérales sont carrées et portent deux cuspides; les dents marginales sont en forme de peigne à plusieurs pointes.

Comme d'ordinaire dans le groupe des *Orthurethra*, il n'existe pas de sillon pédieux ni de glande caudale. La coquille est transparente, à péristome épaissi, et l'ouverture en est souvent dentée.

Famille des *Amastridae* Pilsbry.

Pilsbry[51]), vol. XXIII, p. 61—65.

Cette famille est apparentée à la précédente, fait sur lequel Pilsbry et Watson[80]), p. 24, ont attiré tous deux l'attention.

L'orifice génital est situé très en arrière, près du manteau. Les organes génitaux comprennent une glande albuminipare bien développée, et une grande prostate, composée de tubes glandulaires en forme de doigt. Les animaux étant ovovivipares, rarement ovipares, l'oviducte est généralement transformé en utérus, renfermant plusieurs embryons. Le pédoncule de la poche copulatrice est court (il atteint sa plus grande longueur chez le genre *Leptachatina*; mais il n'égale jamais celui des *Achatinellidae*). Le pénis présente un appendice bien développé et visiblement dilaté du côté distal; près du lieu d'accès de celui-ci, et non à l'extrémité proximale du pénis, se fixe le rétracteur pénien non ramifié.

La mâchoire est forte, arquée, couverte de stries verticales irrégulières; quelquefois elle est nettement composée de plaques, solidement reliées, mais dont les bords libres font saillie à sa surface; quelquefois elle est à peu près lisse ou avec de grossières côtes qui s'avancent sur le bord. Les dents de la radule forment des rangées transversales à peu près droites, dans lesquelles les dents rachiales, latérales et marginales se distinguent nettement les unes des autres; la dent rachiale est toujours beaucoup plus étroite que les latérales, et munie de trois cuspides, ou, comme chez la famille des *Acathinidae*, d'une courte pointe sans fonction. Les dents latérales ont des plaques basilaires carrées et portent deux cuspides. Les marginales sont très variables, avec deux ou plusieurs pointes.

Le rein est souvent dilaté à sa base, où son contour devient, par conséquent, triangulaire.

Famille des *Achatinellidae.*

Pilsbry[51]), vol. XXIII, p. 57—60.

Comme chez la famille précédente, l'orifice génital est situé à une certaine distance de la base de l'ommatophore, mais pourtant sensiblement plus rapproché de celle-ci que du collier palléal.

Pour ce qui concerne les organes génitaux, la glande albuminipare est très petite, presque rudimentaire, mais la prostate est, en revanche, extrêmement développée, composée d'une foule de longs follicules vermiformes, qui se réunissent en formant un corps compacte. Le pédoncule de la poche copulatrice ainsi que l'oviducte libre sont très longs; ce dernier, qui est étroit dans sa partie distale, s'élargit considérablement du côté proximal et forme un utérus à parois minces. Les embryons logés dans celui-ci présentent à la naissance à peu près 3 tours $^1/_2$. Le spermoviducte est très court, par opposition à l'oviducte libre. Le pénis possède un appendice vigoureux, qui se prolonge du côté distal en un long cul-de-sac semblable à un flagellum, mais il n'existe pas de flagellum proprement dit. Le rétracteur pénien est bifurqué; l'une des branches va à l'extrémité du pénis, tandis que l'autre s'insère sur la partie basilaire de l'appendice.

Quant au parcours du rétracteur de l'ommatophore par rapport au pénis, les auteurs ne sont pas d'accord; Pilsbry le fait courir, chez le *Partulina dolei* Bald., au-dessous du pénis, Odhner[45]) (p. 235, note 2), chez l'*Achatinella livida* Swains., au-dessus de celui-ci.

La mâchoire fait défaut ou est extrêmement mince, formée de nombreux éléments verticaux, entièrement soudés, mais dont les bords longitudinaux s'avancent plus ou moins l'un sur l'autre. La radule est très particulière et constitue un des principaux caractères de la famille. Elle est, dans son ensemble, large et courte. Les dents sont très nombreuses et les rangées transversales disposées en forme de V; vue de côté, chaque dent offre l'aspect d'un petit rateau à manche court (*rastriforme*, Pilsbry), étant composée d'une longue plaque basilaire étroite, et d'une partie large, courbée en arrière et munie, au bord, de plusieurs (5—7) pointes de longueur inégale. Les dents sont si semblables qu'on croirait que les rachiales ainsi que les latérales ont été éliminées, et que seules les marginales restent. Leur aspect général rappelle donc beaucoup celles des familles des *Physidae* et des *Athoracophoridae.* Chez

quelques espèces seulement on distingue, dans la ligne médiane, une dent marginale modifiée (dent rachiale), qui porte alors deux ou trois cuspides. La membrane radulaire n'est pas courbée en arrière dans son extrémité antérieure et fermée en anneau, comme chez la famille des *Tornatellinidae.* Les glandes salivaires sont soudées l'une à l'autre autour de l'œsophage.

Le rein est long et étroit, la région sécrétante en est plus longue que le péricarde, et la région antérieure est allongée et semblable à un uretère. La surface du poumon est, en général, fortement pigmentée en noir.

Famille des *Tornatellinidae* (Pilsbry), Odhner.

D'après Odhner[45]), p. 234—245, 249—252.

Les organes génitaux offrent une glande albuminipare bien développée; le pédoncule de la poche copulatrice est assez long, et le spermoviducte très court; l'oviducte libre est long, et forme un sac à parois assez minces dans lequel sont placés les embryons (utérus). La famille est ovovivipare, et 6—15 embryons ont été constatés. La poche de fécondation *(vesicula seminalis)* atteint un développement considérable chez les genres typiques (mais manque (?) chez les *Pacificella*). La prostate est courte, mais d'ailleurs bien développée. Le pénis porte toujours un appendice vigoureux; mais chez les genres typiques, il a été réduit lui-même à une sorte de verrue (tandis qu'il est, au contraire, assez grand chez le genre *Pacificella*). Le rétracteur pénien a deux branches, dont l'une va au pénis, tandis que l'autre se rattache à l'appendice. L'orifice génital est situé entre le pneumostome et la base de l'ommatophore (chez les *Fernandezia* il est plus rapproché du premier). La partie distale des organes génitaux passe au-dessus du rétracteur de l'ommatophore (chez les *Pacificella* tout à fait à droite de celui-ci).

La membrane radulaire est antérieurement courbée en cercle sous l'extrémité linguale, et fermée comme un anneau. La radule elle-même est plissée dans le sens longitudinal et porte des dents rastriformes, comme chez la famille des *Achatinellidae.* La mâchoire fait défaut (ou n'est que faiblement développée, chez le genre *Pacificella*).

Le rein est long et en forme de ruban (chez les *Pacificella* il se rétrécit antérieurement en formant un uretère).

Selon l'indication d'Odhner il est très vraisemblable que le genre *Pacificella* Odhner doit être séparé des autres et considéré comme une famille particulière: *Pacificellidae*, étant donné qu'il diffère assez considérablement de la famille des *Tornatellinidae*, ainsi que nous venons de le signaler. Cette dernière sera par conséquent plus nettement délimitée. Les *Pacificellidae* constituent donc un tronc plus primitif, dont dérivent les familles des *Tornatellinidae* et *Achatinellidae*, celles-ci s'étant spécialisées sous divers rapports.

Famille des *Auriculellidae* Odhner (= *Tornatellinidae* Pilsbry).

Pilsbry[51]), vol. XXIII, p. 66—68, et Odhner[45]), p. 234.

Les organes génitaux comprennent une glande albuminipare rudimentaire et une prostate fortement développée, offrant le même aspect que chez les *Achatinellidae*. La poche copulatrice est placée sur un pédoncule extrêmement long. Le pénis est pourvu d'un appendice, qui manque cependant de muscle rétracteur. Le rétracteur pénien est simple, non divisé, et se rattache à l'extrémité du pénis. L'appendice est plus court que chez les trois familles précédentes, pas beaucoup plus long que le pénis, et non dilaté du côté distal. Le rétracteur de l'ommatophore court entre le pénis et la voie excrétrice femelle.

La radule est construite comme chez la famille des *Achatinellidae*, en ce qu'elle n'offre qu'une seule espèce de dents, les dents rachiales et latérales semblant avoir disparu (radule achatinelloïde).

Le rein est très long et très étroit, semblable à un ruban, sans uretère différencié, et avec un péricarde court à sa base.

Les quatre dernières familles représentent, suivant Pilsbry, les rameaux d'une ancienne famille, à présent éteinte, qui a également donné naissance aux *Cochlicopidae*, *Enidae* et *Pupillidae* (s. lat.).

Famille des *Partulidae*.

Pilsbry[51]), vol. XX, p. 155—159.

Cette famille, dont la coquille ressemble à celle des *Enidae*, présente des points d'analogie avec plusieurs des groupes dont se composait autrefois la famille des *Pupillidae*, mais elle offre aussi

certains traits particuliers, par exemple dans la structure de la mâchoire.

L'orifice génital est situé comme à l'ordinaire, en arrière de l'ommatophore droit (ou gauche). Les organes génitaux sont simplement conformés (haplogones); le pénis a la forme d'un sac sans appendice d'aucune sorte, avec un seul rétracteur terminal comme chez les *Vertigo* ou plutôt comme chez les *Truncatellina*. Le rétracteur de l'ommatophore court entre le pénis et le vagin. Le canal déférent ne s'ouvre pas à l'extrémité du pénis, mais un peu avant celle-ci, sous une papille. Le canal déférent a un parcours analogue à celui du *Lauria*, et les individus de la famille dont nous parlons, sont ovovivipares, comme chez ce genre. Vu que, d'après les indications de Pilsbry, le canal mentionné ne se réunit qu'avec l'extrémité supérieure de l'oviducte, on peut sans doute regarder comme certain que c'est l'oviducte libre qui a été transformé en utérus, et que la région supérieure de l'oviducte, qui se joint au canal déférent, représente uniquement le spermoviducte; c'est donc le même phénomène qui s'observe chez le genre *Lauria* et chez quelques-unes des familles précédentes. Un examen plus minutieux de l'intérieur du spermoviducte serait pourtant nécessaire comme vérification. La poche copulatrice est courte, quelquefois avec une partie basilaire considérablement développée; il n'existe pas de diverticule sur le pédoncule. Les animaux sont ovovivipares, avec 1—5 embryons dans l'utérus.

La mâchoire est mince, transparente et formée de plusieurs plaques fusionnées, plates et étroites, qui convergent en bas vers le milieu. La radule est large et les rangées transversales de dents, dont elle se compose, sont courbées en trois endroits. La dent rachiale, qui porte un long mésocone et le plus souvent de petites pointes de côté, n'est pas beaucoup plus petite que les latérales, lesquelles ont deux cuspides dont le mésocone est long, l'ectocone bien développé. Les nombreuses dents marginales (le *Partula virginea* en possède plus de 120) sont irrégulières et placées de travers, les plaques basilaires formant une longue plaque courbée, à trois pointes tournées en dehors, dont l'intérieure est la plus grande. Ces dents marginales rappellent beaucoup celles des espèces du genre *Pachnodus*.

Le rein est court et triangulaire, de la même longueur que le péricarde, et se prolonge en un uretère, droit et assez long.

Pilsbry (l. c.) ainsi que Watson[80]), p. 26, sont d'avis que la place de cette famille dans le groupe des *Orthurethra* est assez isolée. L'anatomie de l'ancienne famille des *Pupillidae* étant maintenant partiellement connue, il faut cependant admettre que les *Partulidae* ne sont pas plus isolés que les autres familles du même groupe.

La division du groupe des *Orthurethra* d'après notre connaissance actuelle de son anatomie.

Par les recherches ci-dessus citées sur l'anatomie de la famille des *Pupillidae*, il a déjà été démontré que les limites qu'on lui a fixées ne sont pas naturelles, soit qu'on la considère sous sa forme ancienne, c'est-à-dire suivant le système de Fischer, après l'élimination des éléments étrangers, telle qu'elle a été mentionnée plus haut, soit que nous la prenions avec toute l'étendue que lui donne Pilsbry. La famille comprend des éléments si divergents que la différence entre plusieurs de ceux-ci est aussi grande ou même encore plus grande qu'entre quelques-unes des familles dont se compose le groupe des *Orthurethra*, et — ce qui est encore plus regrettable — il est impossible de trouver un seul caractère de quelque importance, ou un ensemble constant de qualités, pouvant rallier entre eux tous les genres de la famille. On pourra toujours retrouver ces caractères dans une ou plusieurs des autres familles du groupe des *Orthurethra*. Il existe parmi les genres des *Pupillidae*, des formes chez lesquelles la glande albuminipare est grande, et d'autres chez lesquelles elle est petite; la prostate peut être longue et en forme de ruban, petite et triangulaire, ou elle peut faire complètement défaut. La section femelle du spermoviducte a, dans quelques cas, la forme d'un simple sac, dans d'autres elle est garnie de plis compliqués; elle peut offrir un cul-de-sac bien développé ou faiblement, ou en être complètement dépourvue. La poche copulatrice présente chez quelques-uns un pédoncule long, chez d'autres il est court; tantôt il existe un diverticule, tantôt il manque. Le pénis s'est développé de plusieurs manières différentes; il varie depuis un tube tout simple sans appendice, jusqu'à un appareil pénien très complexe, avec appendice et 1—2 diverticules; certains groupes présentent un rétracteur

pénien simple, chez d'autres il est bifurqué. Le système des rétracteurs peut être ou non en relation avec la partie distale des organes génitaux. La radule et la mâchoire varient extrêmement, surtout la première. Il suffit, pour s'en convaincre, de considérer des types aussi différents que le sont le *Chondrina avenacea*, l'*Orcula dolium*, le *Vertigo moulinsiana* et le *Columella edentula.*

Si on remarque des traits communs entre tous les groupes de la famille, on s'aperçoit bientôt qu'ils se retrouvent dans toute la grande division des *Orthurethra.* Quand on considère la structure de la coquille, on constate qu'elle est tellement variable qu'on a l'impression que la famille se compose de tous les genres restants qu'il n'avait pas été possible de ranger dans les autres divisions des *Orthurethra.*

Etant donné ces circonstances, et avec notre connaissance actuelle de l'anatomie, deux procédés seulement semblent applicables. L'un a été indiqué par Watson[80]), p. 24—30. Il propose de considérer la plupart des familles existantes dans le groupe des *Orthurethra* comme des sous-familles d'une très grande famille qui devra comprendre presque tous les *Orthurethra*, et qui probablement s'appellera *Pupillidae* s. lat.*) Toutes les familles et tous les groupes de quelque importance étudiés dans le présent travail deviendront alors des sous-familles coordonnées.

Le second procédé consiste à faire de tous les groupes étudiés, qui formaient autrefois l'ancienne famille des *Pupillidae* (s. lat.), des familles (et des sous-familles) particulières, coordonnées à celles déjà existantes dans le groupe des *Orthurethra.*

Le dernier procédé a été choisi dans cet ouvrage, pour les raisons suivantes: Il existe toujours dans l'ancienne famille des *Pupillidae,* plusieurs genres qui n'ont pas encore été examinés, et dont l'étude donnera lieu peut-être à la création de familles nouvelles ou à la réunion de deux ou de plusieurs de celles déjà existantes. Il est donc beaucoup plus pratique que chaque groupe reste isolé et exactement défini, plutôt que de les relier pour en former un tout. Une autre raison, c'est qu'il sera certainement

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*) Outre cette famille, Watson ne rapporte aux *Orthurethra* que les familles *Achatinellidae* (avec sous-fam. *Tornatellininae*) et *Partulidae.*

nécessaire, lorsqu'un plus grand nombre de genres et d'espèces aura été examiné, de pratiquer dans plusieurs familles une division en sous-familles, par exemple dans celle des *Enidae*; celles ci peuvent mieux être mises en relief de cette manière que si elles étaient réduites à former des sections de la sous-famille *Eninae*. Il s'agit, en effet, de donner aux notions de famille, sous-famille, et section, à peu près la même valeur dans tous les groupes principaux des Pulmonés, et les caractères dont on s'est servi dans le groupe des *Orthurethra* pour séparer les familles, sont tout aussi bons que ceux qui ont été employés dans les autres divisions des Pulmonés.

Pour ce qui est de la division systématique, je me rallie au point de vue auquel se placent, entre autres, trois malacologistes bien connus: O. Boettger, A. Wagner et P. Hesse, et qui se trouve exprimé dans un travail du premier: «Die Entwicklung der Pupa-Arten des Mittelrheingebiets in Zeit und Raum», 1889[9]), p. 230—31, et que cite Hesse[27]), p. 160:

«Ich bin einer von den Systematikern, die durch Aufstellung von möglichst vielen kleineren Kategorieen eine übersichtliche Gliederung des Gegenstandes zu erzwingen suchen, und die sich freuen, wenn durchschlagende Charaktere in dieser Hinsicht gefunden werden, welche zugleich mit Lebensweise und geographischer Verbreitung Hand in Hand gehen.»

Le présent ouvrage, conçu comme projet pour la systématique des Pulmonés orthurethriques, a été cependant imaginé comme une systématique devant servir de base à des travaux ultérieurs, car je vois très bien que lorsque la structure intérieure des animaux sera entièrement expliquée, on pourra peut-être rattacher en partie les différents groupes les uns aux autres, d'une manière semblable à celle déjà esquissée par Watson[80]), p. 25, et à l'aide des formes maintenant éteintes, dont le nombre augmente toujours et qui à présent sont étudiées avec ardeur (par W. Wenz[83]), par ex.), on pourra donner une idée assez précise de la phylogénie de cette division des Pulmonés, qui est ancienne et, sous beaucoup de rapports, primitive.

Un examen plus étendu de la structure intérieure du pénis, de l'oviducte libre et du spermoviducte, serait fort à désirer. L'étude de ces deux dernières parties des organes génitaux dans les dif-

férents groupes des Pulmonés, pourra de préférence fournir fréquemment des renseignements, si les autres caractères font défaut. Quand toutes les divisions des *Orthurethra* seront examinées, il sera peut-être possible de trouver l'origine des différentes familles sigmurethriques, par exemple des *Clausiliidae*, car A. J. Wagner[78], p. 102, et Thiele[75], p. 152, ont sans doute raison en disant que ces derniers sont étroitement liés avec le groupe des *Orthurethra*, spécialement avec les familles des *Enidae* et des «*Pupidae*». Provisoirement il faut cependant en exclure les Clausilies. J'ai cru autrefois que cette famille tirait son origine des *Enidae*, avec lesquels elle a plusieurs traits de ressemblance: la longue prostate en forme de ruban, et les trois conduits du spermoviducte, dont l'existence a été démontrée dans mon étude sur l'anatomie des Clausilies danoises, mais après avoir pris connaissance des *Pupillidae*, je suis plutôt disposé à rattacher les Clausilies au groupe des *Lauria*; il existe, dans la structure de l'oviducte libre et du spermoviducte, une analogie étonnante entre les deux genres *Lauria* et *Balea**), analogie qui ne peut pas être due uniquement à la circonstance qu'ils sont tous deux ovovivipares.

Je terminerai par un aperçu de la systématique du groupe des *Orthurethra*, telle que je me la représente d'après mes propres recherches, et suivant le principe susmentionné. Pour les définitions des divisions indiquées, je renvoie aux diagnostics des groupes nouvellement créés (c.-à-d. familles et sous-familles), ainsi que des familles déjà existantes, donnés p. 174—197.

Il résulte de cet aperçu que l'ancienne famille des *Pupillidae* a été partagée en 5—7 familles, et que le nom de *Pupillidae* (s. str.) ne s'applique maintenant qu'à celle dont le représentant le plus important est l'ancien genre *Pupilla*.

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*) Il existe également des points de ressemblance dans la structure de la coquille.

STYLOMMATOPHORA.

I. *Heterurethra (Elasmognatha).*

II. *Sigmurethra.*

1. *Holopoda.*
2. *Aulacopoda.*

III. *Orthurethra.*

1) Fam. *Chondrinidae.*

Gen. 1. *Abida* Leach.
Gen. 2. *Sandahlia* Wstld.
Gen. 3. *Chondrina* Reichb.

2) Fam. *Orculidae.*

Gen. 1. *Orcula* Held.
Gen. 2. *Orculella* n. g.
Gen. 3. *Pagodulina* Cl.
(= *Pagodina* Stab.).

3) Fam. *Pupillidae.*

1. Subfam. *Lauriinae.*
Gen. *Lauria* Gray.
2. Subfam. *Pupillinae.*
Gen. *Pupilla* Leach.

4) Fam. *Vertiginidae.*

1. Subfam. *Nesopupinae.*
Gen. *Nesopupa* Pilsb.
2. Subfam. *Vertigininae.*
Gen. *Vertigo* Müll.
3. Subfam. *Truncatellininae.*
Gen. 1. *Truncatellina* Lowe.
Gen. 2. *Columella* Wstld.

5) Fam. *Valloniidae.*

1. Subfam. *Valloniinae.*

Gen. 1. *Vallonia* Risso.
Gen. 2. *Acanthinula* Beck.
Gen. 3. *Spermodea* Wstld.
Gen. 4. *Zoogenetes* Morse *(Zoogenites).*

2. Subfam. *Pyramidulinae.*

Gen. *Pyramidula* Fitz.

? 3. Subfam. *Spelaeodiscinae* (= *Aspasitinae).*

Gen. *Spelaeodiscus* Brus. (= *Aspasita* Wstld.).

6) Fam. *Patulastridae* (*Pleurodiscidae* Wenz[83]).

Gen. *Patulastra* Pfeif. (= *Pleurodiscus* Wenz).

7) Fam. *Strobilopsidae.*

Gen. *Strobilops* Pilsb.

8) Fam. *Enidae.*

9) Fam. *Pachnodidae* (ou *Pachnodinae* comme sous-fam. des *Enidae*).

Gen. *Pachnodus* v. Mart. (et peut-être plusieurs autres genres).

10) Fam. *Partulidae.*

11) Fam. *Cochlicopidae.*

12) Fam. *Amastridae.*

13) Fam. *Achatinellidae.*

? 14) Fam. *Pacificellidae* (Odhner).

15) Fam. *Tornatellinidae* (Odhner).

16) Fam. *Auriculellidae* (Odhner).

Les systèmes anatomiques comme celui que nous venons de constituer, ont malheureusement ce défaut qu'il est difficile d'y insérer les formes éteintes et les groupes qui n'ont pas encore été examinés à ce point de vue. Chez Pilsbry (Tryon, Manual, vol. 24—26) on trouve plusieurs genres dont les parties molles ou la radule ne sont pas du tout étudiées.

Pour pouvoir les classer, ainsi que les genres éteints, nous assimilerons provisoirement la sous-famille des *Gastrocoptinae* de Pilsbry avec la famille des *Chondrinidae*, et nous joindrons à celle-ci les genres qui y ont été inclus[51]) (vol. 24, p. XI); mais on verra probablement dans la suite, que «le groupe des *Abida*» de Pilsbry (outre les genres *Abida* Leach, *Sandahlia* Wstld. et *Chondrina* Reichb., ceux de *Fauxulus* Schauf., *Odontocyclas* Schlüt. et *Granopupa* O. Boettg.) pourra seul être admis, en tout ou en partie, dans la famille des *Chondrinidae*, tandis qu'on sera obligé d'en séparer les trois groupes suivants pour les classer dans d'autres familles, ou bien pour en former des familles particulières. Ces groupes sont:

1⁰ le groupe des *Gastrocopta* avec les genres: *Chaenaxis* Pilsb. et Ferr., *Gibbulina* Beck, *Gastrocopta* Woll. (= *Bifidaria* Sterki = *Leucochilus* Boettg.), et *Bothriopupa* Pilsb.

2⁰ le groupe des *Hypselostoma* avec: *Hypselostoma* Bens., *Anauchen* Pilsb., *Boysidia* Anc., *Gyliauchen* Pilsb.

3⁰ le groupe des *Aulacospira* avec: *Aulacospira* v. Mlldff., et *Systenostoma* B. & D.

Aux *Pupillidae* (sous-famille *Pupillinae*) se rapportent provisoirement, outre le genre *Pupilla*, ceux de *Pupoidopsis* Pilsb. & Cooke, *Pupoides* Pf., *Microstele* Boettg., *Microcerion* Dall, et *Boysia* Pf. — Selon Pilsbry[51]) et Wenz[83]) on peut joindre à la sous-famille *Lauriinae* le genre *Agardhia* Gude.

Dans les *Vertiginidae* on peut ranger provisoirement les genres placés par Pilsbry dans la sous-famille *Vertigininae*: *Staurodon* Lowe, *Lyropupa* Pilsb., *Ptychalaea* Boettg., *Campolaemus* Pilsb., *Costigo* Boettg., *Pronesopupa* Ired., *Pupisoma* Stol., *Cylindrovertilla* Boettg., *Sterkia* Pilsb., *Acmopupa* Boettg., *Negulus* Boettg., *Glandicula* Sandb., *Enneopupa* Boettg., et *Pseudelix* Boettg.

W. Wenz rapporte à la famille des *Valloniidae**) (sous-famille *Valloniinae*) les genres *Acanthopupa* Wenz et *Sagdellina* Cossm.

*) Appelée par Wenz *Acanthinulinae*.

Résumé.

1° L'ancienne famille des *Pupidae* ou des *Pupillidae* (dans la délimitation que lui donne P. Fischer) ne constitue pas une unité naturelle, même après l'élimination des éléments étrangers entreprise dans les dernières années et due principalement à H. Pilsbry; elle se compose, selon les présentes études anatomiques, d'éléments extrêmement hétérogènes.

2° La dissemblance entre les différents groupes de la famille des *Pupillidae* (Pilsbry) est souvent aussi grande, ou même plus grande, qu'entre les différentes familles du groupe des *Orthurethra*.

3° Il sera donc nécessaire de diviser la famille en plusieurs nouvelles, comme le montre le tableau p. 201—202. Au même endroit sont indiquées les autres familles appartenant au groupe des *Orthurethra*, afin qu'on puisse trouver là un aperçu sur tous les éléments dont se compose ce groupe.

4° Les familles nouvelles ne peuvent pas être considérées comme étant seulement les sous-familles de Pilsbry érigées en familles, vu que la répartition des genres entre les familles de l'auteur n'est généralement pas la même qu'entre les sous-familles de Pilsbry. Les genres *Pagodulina*, *Spelaeodiscus (Aspasita)*, *Orcula*, *Lauria* et *Columella* en peuvent servir d'exemples.

5° Les familles du groupe des *Orthurethra* sont le plus souvent bien distinctes, et les divergences entre elles sont aussi grandes qu'entre les familles des deux autres groupes: *Sigmurethra holopoda* et *Sigmurethra aulacopoda*. Il n'y a donc présentement pas lieu de réunir la plupart des *Orthurethra* en une seule grande famille.

6° C'est chez la famille des *Clausiliidae* du groupe des *Sigmurethra* et chez le genre *Lauria* du groupe des *Orthurethra* qu'il faut chercher le lien qui relie entre eux ces deux groupes. Bien que les *Lauria* soient des Pulmonés orthurethriques typiques, la structure du spermoviducte présente beaucoup de ressemblance avec celle des Clausilies (spéc. du genre *Balea*).

7° Les organes génitaux des diverses espèces du même genre sont tellement variables, qu'à part quelques exceptions isolées, ils pourraient seuls servir de base à la détermination des animaux; pour cette raison ils se trouvent minutieusement dé-

crits dans chaque espèce. La radule offre souvent des traits caractéristiques pouvant servir à distinguer les espèces. Les autres organes des parties molles ne fournissent au contraire que rarement des caractères distinctifs.

8⁰ L'auteur a antérieurement démontré chez les Clausilies la présence d'un organe nouveau: le canal séreux ou le cul-de-sac de l'oviducte. Cet organe a été également trouvé, dans un état bien développé, chez les familles nouvelles: *Chondrinidae* et *Orculidae*, et, à l'état rudimentaire, chez quelques-unes des autres familles. Sa structure se trouve exposée en détail. L'organe pourrait certainement être employé aussi comme caractère systématique important dans d'autres familles que celles qui ont été étudiées ici, par exemple dans les familles des *Cochlicopidae*, des *Enidae* et des *Pachnodidae.*

9⁰ Des espèces vivipares (ou ovovivipares) se rencontrent dans la famille des *Pupillidae* (s. str.) et dans le genre *Zoogenetes* Morse (fam. *Valloniidae*). Chez ces espèces l'utérus peut être formé de trois manières: 1⁰ De la section femelle du spermoviducte seul *(Pupilla)*; 2⁰ de l'oviducte libre seul *(Lauria)*; 3⁰ de tous les deux ensemble *(Zoogenetes).*

10⁰ Une prostate extérieure se constate chez tous les genres examinés, à l'exception du *Truncatellina* et du *Columella.*

11⁰ Chez les *Truncatellina* s'observe la particularité que le canal déférent, après avoir pris naissance sur le spermoviducte, court longtemps dans la paroi de l'oviducte libre, de sorte que ce dernier apparaît comme extrêmement court, ou bien semble faire complètement défaut.

12⁰ Chez plusieurs des espèces examinées — surtout parmi les petites formes — le pénis et une grande partie du canal déférent font défaut, même si la coquille est tout à fait développée.

13⁰ Les dents des Maillots peuvent être rapportées à trois types différents:

1^er type: Dents rachiales à 1—3 cuspides; dents latérales à 2 cuspides, dont l'ectocone est beaucoup plus petit que le mésocone, ou fait complètement défaut. Dents marginales à plusieurs pointes.

A. Les dents rachiales sont unicuspides ou portent de faibles pointes de côté (formées par l'appui dentaire); l'ectocone

des dents latérales est petit, ou manque complètement, et les marginales ne présentent que peu de pointes *(Chondrinidae).*

B. Les dents rachiales portent des cuspides de côté vigoureuses; l'ectocone des dents latérales est grand, et les marginales sont en forme de peigne (*Pupillidae, Valloniidae, Orcula* — dans ce dernier, les marginales diffèrent un peu du type ordinaire).

2e type: Toutes les dents ont trois cuspides, et des pointes accessoires se sont développées entre les cuspides principales *(Vertigininae).*

3e type: Les dents rachiales portent trois cuspides, les latérales, deux, qui sont égales; il existe, en outre, des pointes accessoires *(Truncatellininae).*

14° La mâchoire des Maillots peut également être rapportée à 3 types:

1er type: Mâchoire finement striée dans le sens vertical, et dont la structure indique une composition de plaques très étroites, fusionnées entre elles *(Chondrinidae, Orcula).*

2e type: Mâchoire formée de plaques plus larges, étroitement serrées et fusionnées. Chaque lieu de fusion n'apparaît que comme une seule ligne étroite *(Pupillidae, Truncatellininae, Zoogenetes).*

3e type: Mâchoire formée par fusionnement d'un nombre assez restreint de larges plaques, séparées par des sillons verticaux, clairs et relativement larges *(Vertigo, Nesopupa).*

15° L'organe pulsateur de la cavité pulmonaire — appelé l'organe de Mermod — se trouve bien développé chez toutes les espèces examinées.

16° Chez les Maillots le cordon viscéral et ses ganglions offrent peu de concentration, et le système nerveux est, en somme, d'un type primitif peu modifié.

18.—6.—25.

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ИЗВѢСТІЯ ИМПЕРАТОРСКАГО ОБЩЕСТВА ЛЮБИТЕЛЕЙ ЕСТЕСТВОЗНАНІЯ, АНТРОПОЛОГІИ И ЭТНОГРАФІИ
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Les ouvrages marqués d'un astérisque (*) ne m'ont pas été accessibles.

POSTFACE

Pour la publication de ce travail j'ai reçu des secours de différents côtés, tant publics que privés. Comme ce concours précieux m'a été prêté après le commencement du tirage de l'étude, je n'ai pas pu en faire mention dans le traité même; je saisis donc l'occasion d'exprimer ici ma plus vive reconnaissance à la Direction de la fondation *Rask-Ørsted,* qui s'est chargée des frais de la traduction en français, ainsi qu'à l'Administration de la fondation de legs *Carlsen-Lange,* qui a contribué de ses moyens à la publication, de même que j'adresse mes sincères remerciements à toutes les personnes privées qui m'ont prêté leur secours pécuniaire de si bonne grâce et d'une manière si aimable. Je tiens enfin à présenter à la traductrice, M^lle^ Magda Schroll, Agrégée des Lettres, l'assurance de ma gratitude pour son travail consciencieux et soigné.

Copenhague le 18. juin 1925.

C.-M. Steenberg.

Table des Matières.

Planche I.

Région antérieure de *Chondrina (Solatopupa) similis* Brug., montrant les parties molles dans leur position naturelle. La peau de la nuque, le manteau et les organes de la cavité pulmonaire ont été écartés.

an_1, première anse intestinale; *dp*, diaphragme; *ds*, conduit excréteur d'une des glandes salivaires; *ép*, épiphallus; f_2, f_3, foie; *fl*, flagellum; *ga*, glande albuminipare; *gb*, ganglion buccal; *gc*, ganglion cérébroïde; *gs*, glande salivaire; *mc*, muscle columellaire; *oe*, œsophage; *om*, ommatophore; *ov*, oviducte; *pa*, papille radulaire; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *ph*, pharynx; *pr*, prostate; *rp*, rétracteur pénien; *va*, vagin; *vd*, canal déférent; II, III, lacets intestinaux.

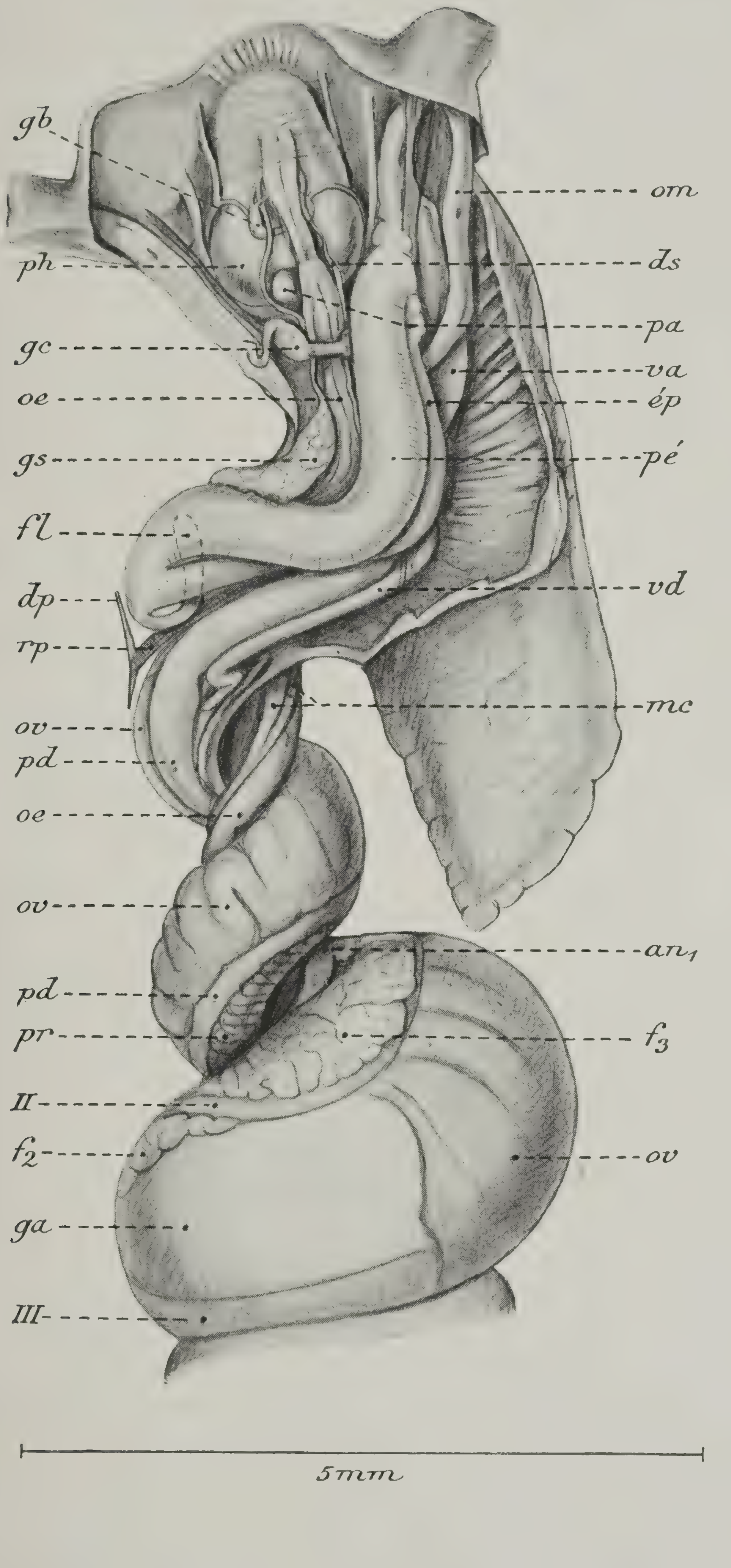

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Planche II.

Fig. 1. Organes génitaux de *Chondrina (Solatopupa) similis* Brug , vus par-dessus. L'échelle se trouve au-dessous de la figure.

a-f, région supérieure, dilatée, de l'oviducte (voir le texte, p. 28—29); *ci*, emplacement de l'intestin dans la glande albuminipare; *cl*, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *fl*, flagellum; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *om*, ommatophore; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; pd_1, partie basilaire, élargie, de celui-ci; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, muscle allant au cloaque génital; dans la figure il est détaché de la partie supérieure du cloaque, à laquelle il était auparavant fixé; *re*, rétracteur externe; *rl*, rétracteur labial; *ro*, rétracteur de l'ommatophore; *rp*, rétracteur pénien; rp_1, rp_2, les deux branches de celui-ci; *rpd*, rétracteur pédieux; *rpt*, rétracteur du petit tentacule; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

Fig. 2. *Chondrina similis*. Coupe transversale du canal déférent, montrant l'aspect de la lumière.

Fig. 3. Plafond de la cavité pulmonaire avec ses organes chez l'*Abida secale* Drap. L'échelle (5 mm) placée verticalement s'applique à cette figure.

co, collier palléal; *cv*, faible pli et rainure qui de l'orifice rénal conduisent en arrière (v. le texte, p. 162); *of*, orifice rénal (orifice de l'uretère); *or*, oreillette; *pc*, péricarde; *rn*, sac rénal; *ur*, uretère; *ve*, ventricule; *vp*, veine pulmonaire; *III*, rectum.

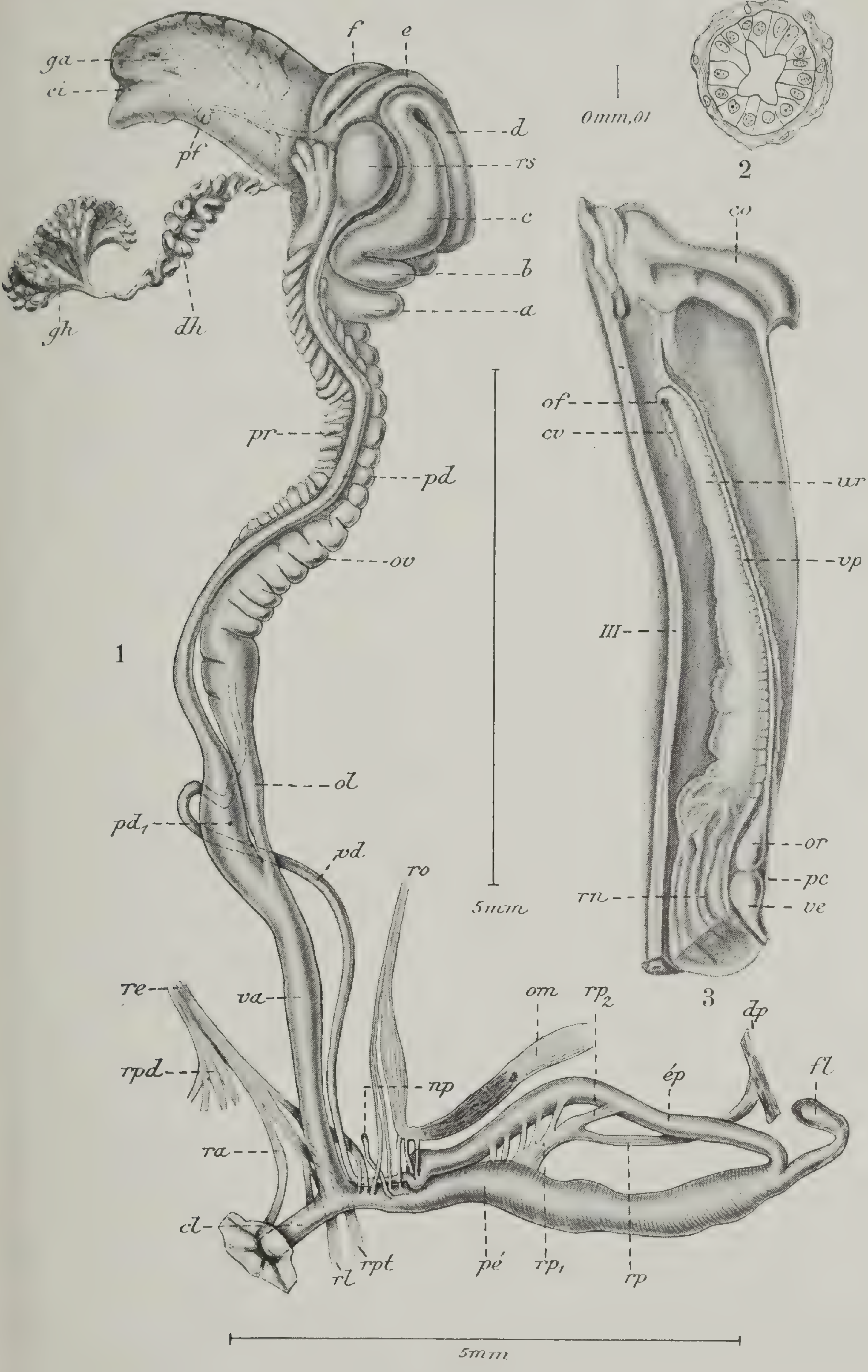

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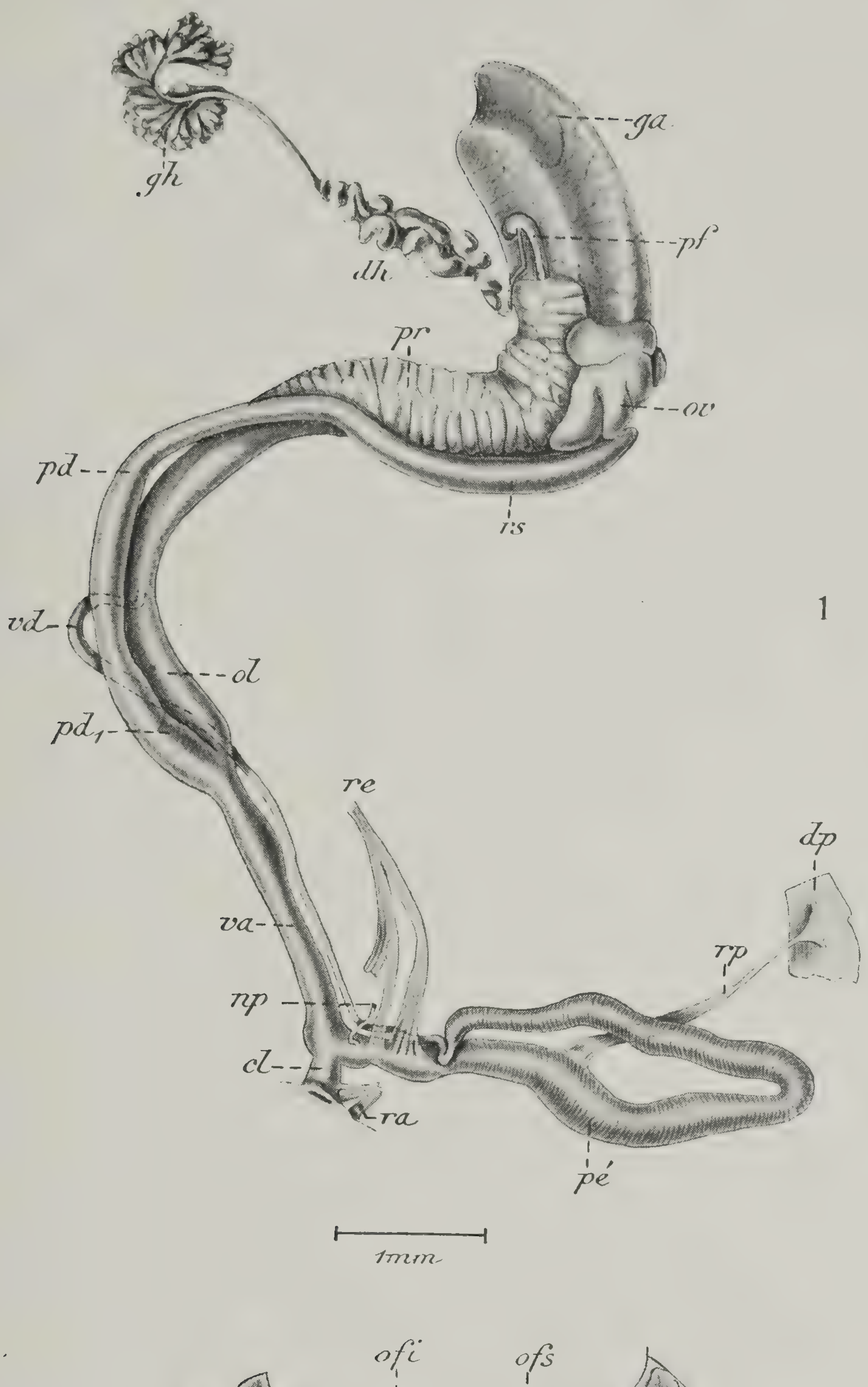
Planche III.

Fig. 1. Organes génitaux de *Chondrina avenacea* Brug., vus par-dessus.

cl, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; pd_1, partie basilaire, élargie, de celui-ci; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, partie du rétracteur pédieux allant au cloaque génital; *re*, rétracteur externe; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

Fig. 2. Région postérieure de l'estomac chez *Chondrina similis* Brug.

chp, chambre postérieure de l'estomac; *fi*, foie inférieur; *fs*, foie supérieur; *ofi*, orifice du foie inférieur; *ofs*, orifice du foie supérieur; *oi*, ouverture conduisant dans l'intestin; *pl*, pli en forme de croissant, qui sépare la chambre postérieure du reste de l'estomac.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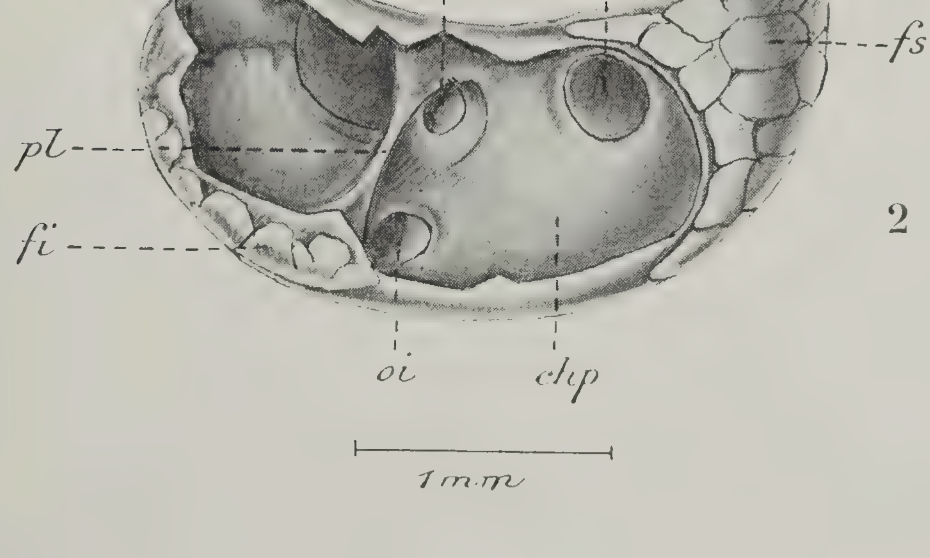
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Planche IV.

Fig. 1. Organes génitaux d'*Abida partioti* Moq., vus par-dessus. La vésicule de la poche copulatrice se trouve dans sa position naturelle, serrée contre l'oviducte; ici, l'extrémité en a été détachée.

Fig. 2. Musculature du pénis et du cloaque génital chez la même espèce.

L'échelle à gauche de la fig. 1 s'applique tant à celle-ci qu'à la figure 2. Les lettres suivantes conviennent aux deux figures:

cl, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *fl*, flagellum; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; pd_1, base élargie de celui-ci; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; r_3, rétracteur du cloaque génital; *re*, rétracteur externe; *ro*, rétracteur de l'ommatophore; *rp*, rétracteur pénien; *rpd*, rétracteur pédieux; *rpt*, rétracteur du petit tentacule; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

Fig. 3. Mâchoire de *Sandahlia cylindrica* Mich.

Fig. 4—6. Ces figures reproduisent trois coupes transversales, un peu schématisées, du pénis chez *Chondrina similis* Brug.; elles montrent l'aspect des plis longitudinaux les plus importants.

Fig. 4. Coupe transversale de la partie distale du pénis, à une certaine distance du flagellum.

Fig. 5. Coupe transversale de l'épiphallus, tout près du flagellum.

Fig. 6. Coupe à travers le milieu de l'épiphallus.

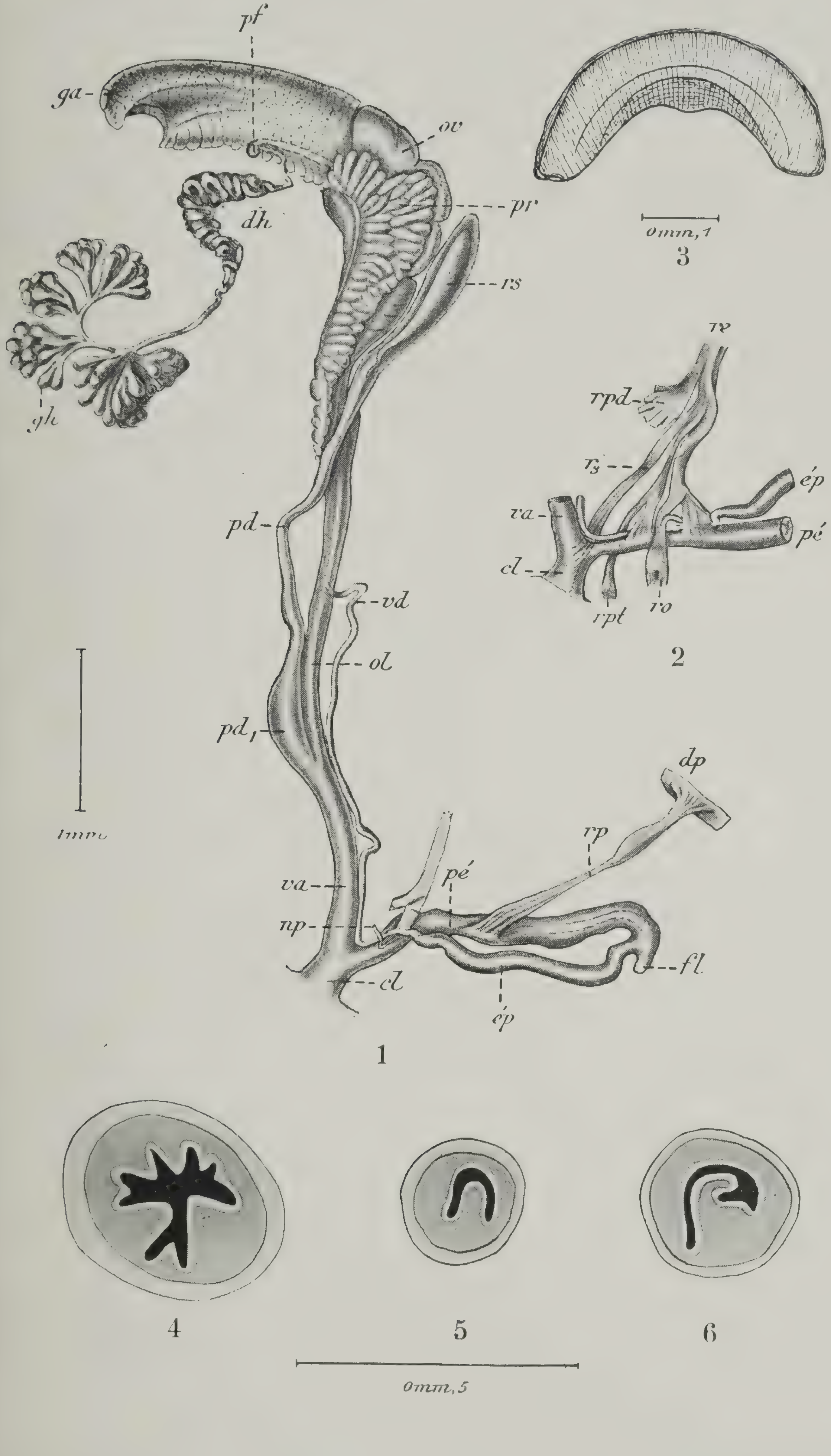

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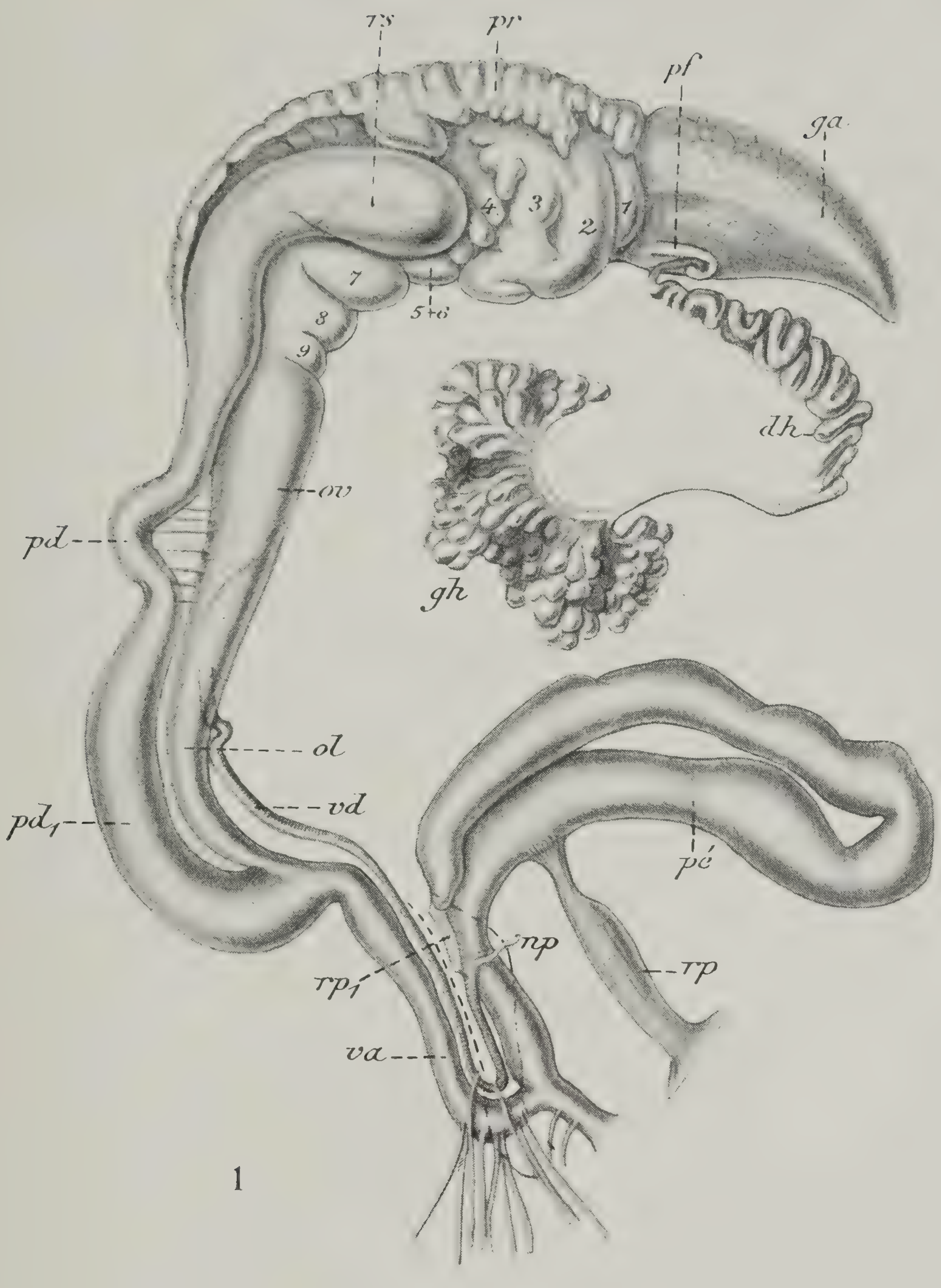
Planche V.

Fig. 1. Organes génitaux d'*Abida secale* Drap.; à l'exception de la partie distale, ils sont vus par la face inférieure et extérieure.

dh, canal hermaphrodite; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; pd_1, partie basilaire, élargie, de celui-ci; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *rp*, rétracteur pénien; rp_1, rétracteur pénien supplémentaire; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent; *1—9*, lacets formés par l'oviducte (voir le texte).

Fig. 2. Mâchoire de *Chondrina similis* Brug.

Fig. 3. Mâchoire d'*Abida secale* Drap.



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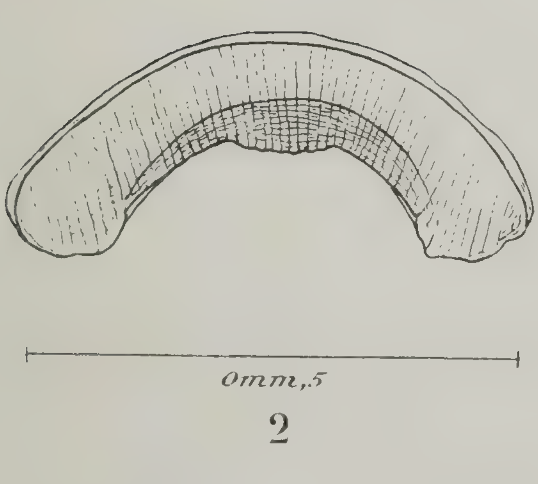

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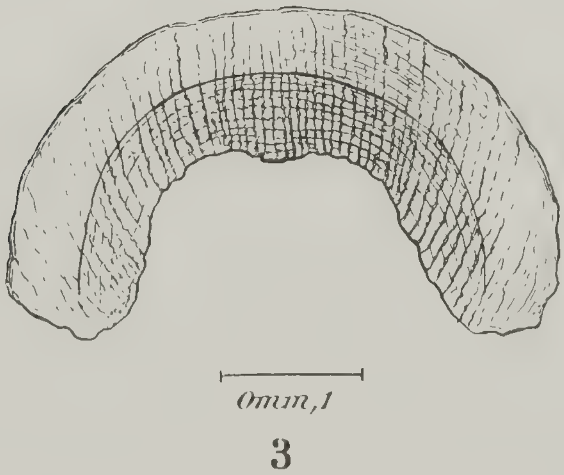

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Planche VI.

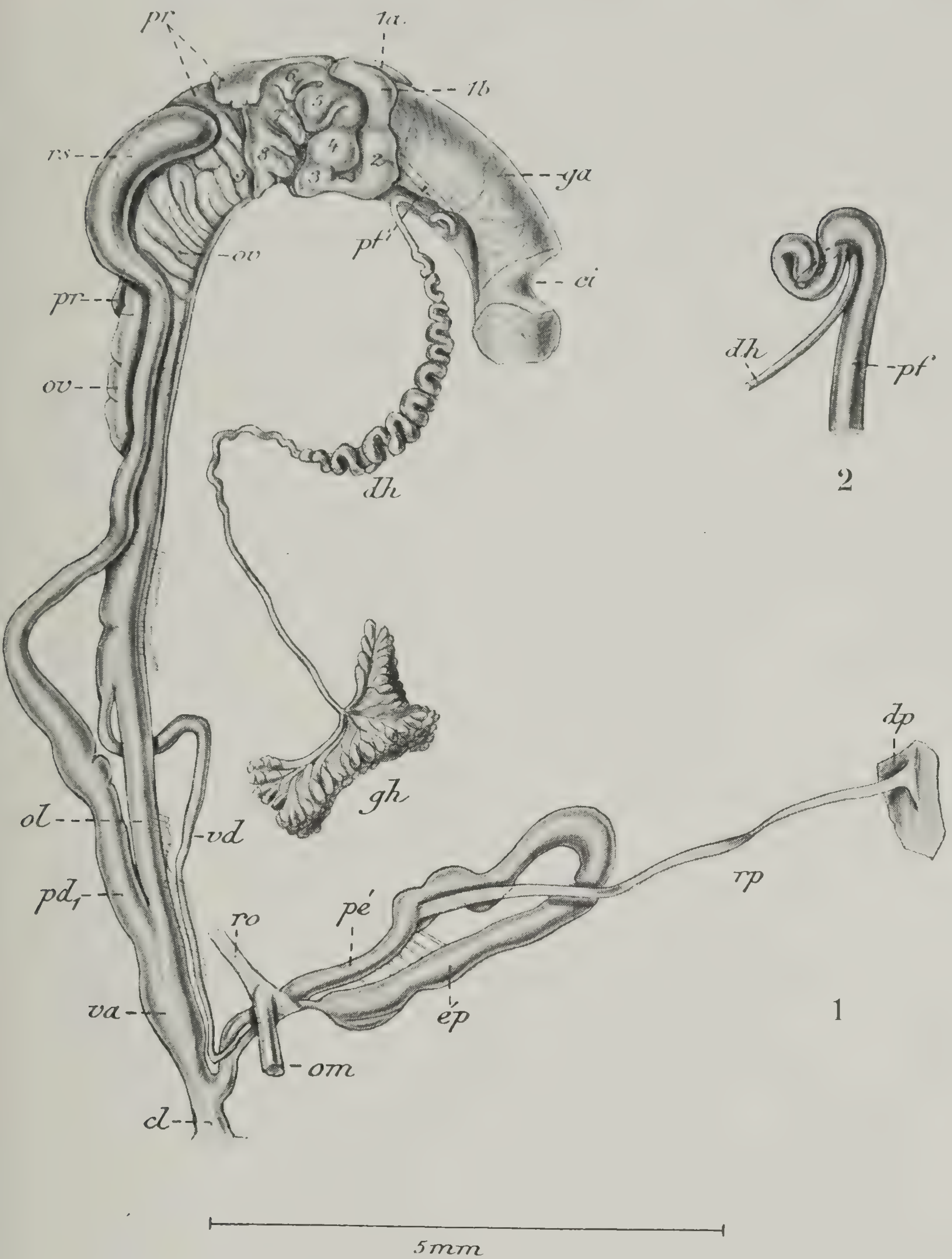
Fig. 1. Organes génitaux de *Sandahlia cylindrica* Mich., vus, à l'exception de la partie distale, du côté inférieur et extérieur.

1—9, lacets proximaux de l'oviducte; *ci*, sillon où est logé l'intestin; *cl*, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ol*, oviducte libre; *om*, ommatophore; *ov*, section femelle du spermoviducte; pd_1, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ro*, rétracteur de l'ommatophore; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

Fig. 2. Poche de fécondation du même individu, mais plus fortement grossie. Mêmes lettres que pour la figure précédente.

Fig. 3. Mâchoire d'*Orcula dolium* Drap.

Fig. 4. Mâchoire de *Pupilla muscorum* L., un peu irrégulièrement construite.



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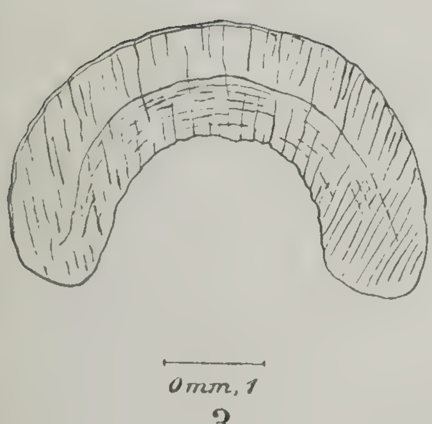

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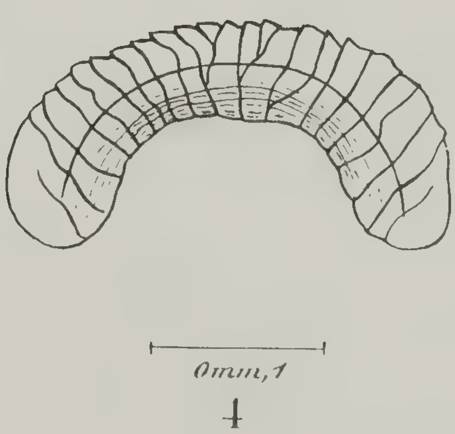

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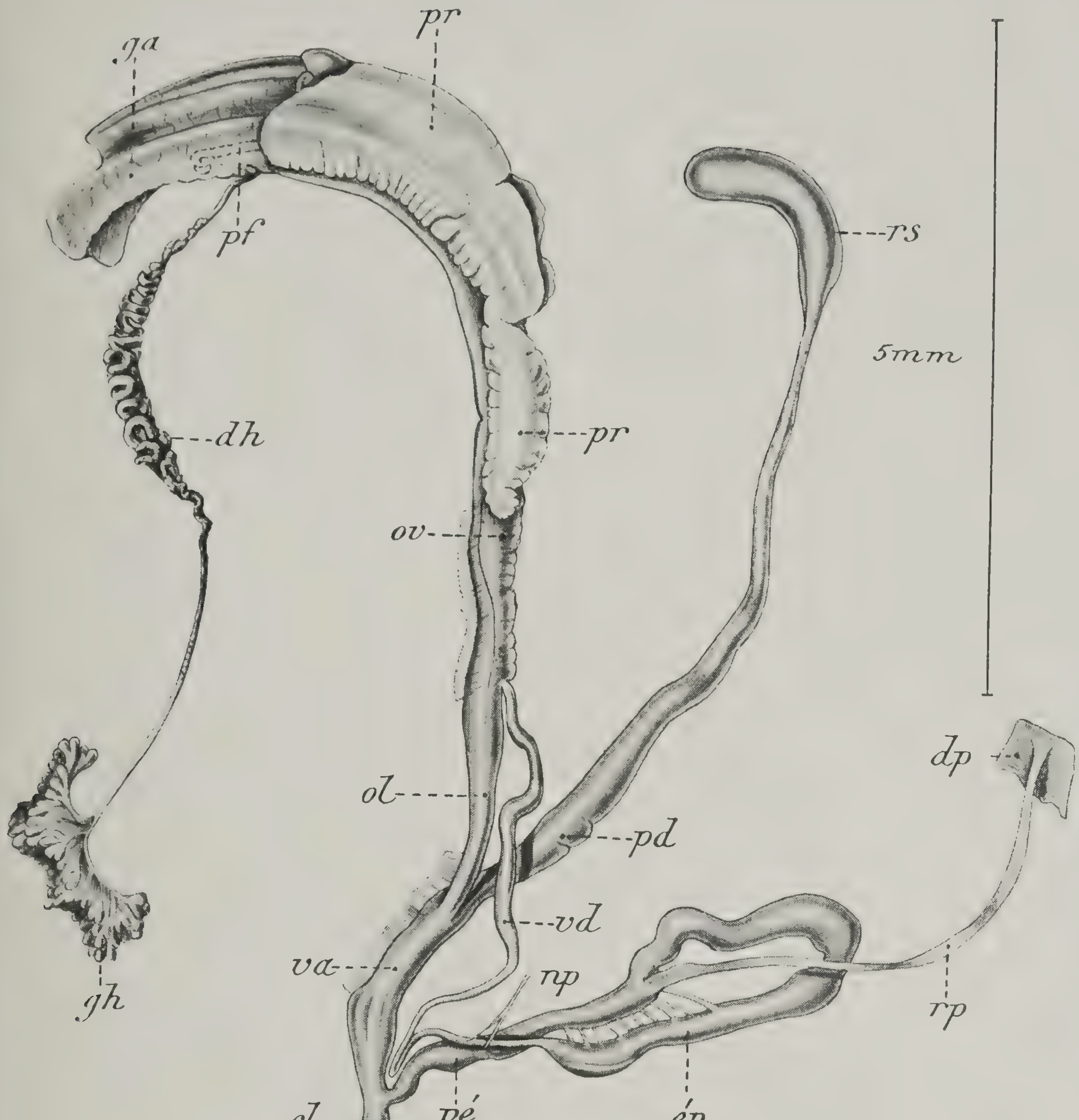
Planche VII.

Fig. 1. Organes génitaux de *Sandahlia cylindrica* Mich., vus par la face supérieure. La poche copulatrice a été détachée du spermoviducte.

Fig. 2. Musculature du pénis chez la même espèce.

cl, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *re*, rétracteur externe; *rl* + *ra*, rétracteur labial et rétracteur du cloaque génital; *ro*, rétracteur de l'ommatophore; ro_1, ro_2, ramifications latérales de celui-ci; *rp*, rétracteur pénien; *rpd*, rétracteur pédieux; *rpt*, rétracteur du petit tentacule; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.



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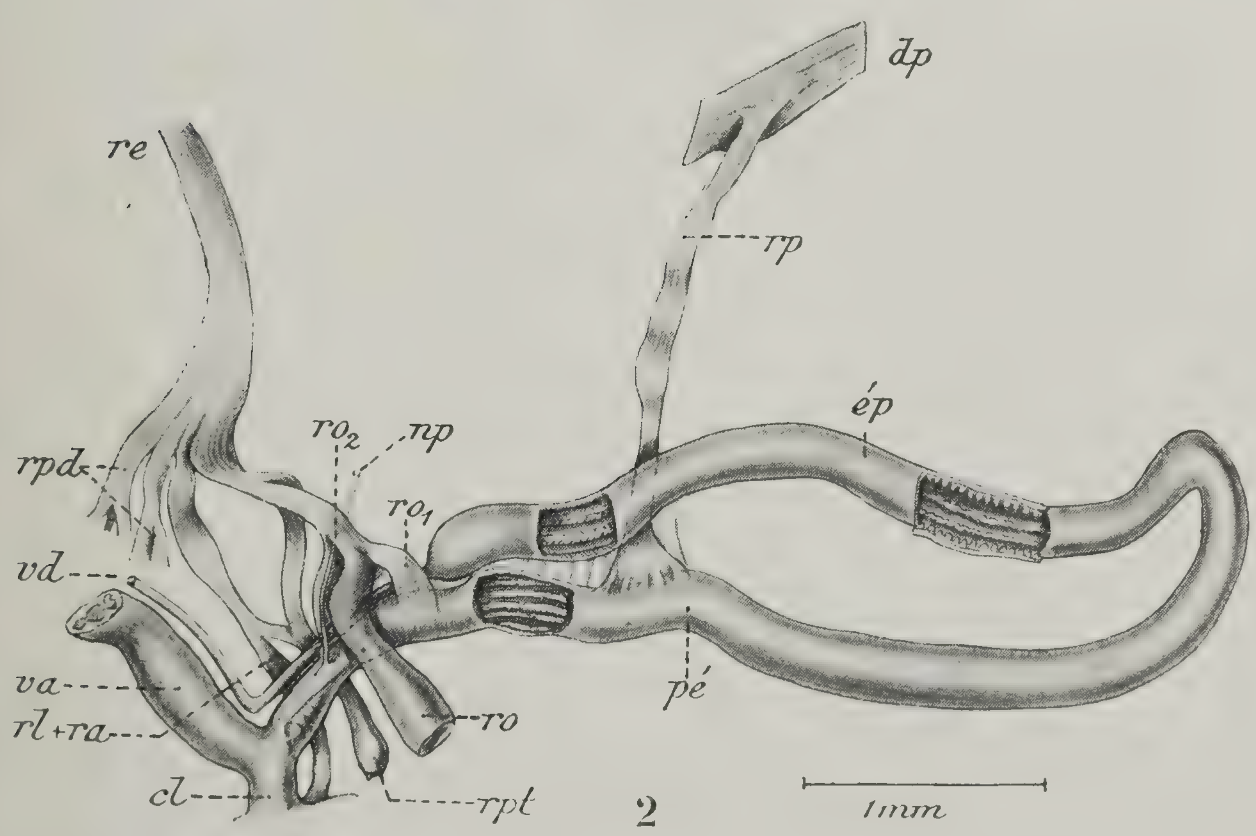

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Planche VIII.

Fig. 1. Organes génitaux d'*Orcula dolium* Drap., vus par-dessus.

Fig. 2. Partie inférieure du spermoviducte, vue du côté columellaire et montrant le cul-de-sac de l'oviducte.

ap, appendice pénien; *ch*, chambre d'albumine; *cl*, cloaque génital; *cs*, canal séminal; *cso*, cul-de-sac de l'oviducte; *dh*, canal hermaphrodite; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, section femelle du spermoviducte; p_1—p_4, section proximale du pénis; *pd*, pédoncule de la poche copulatrice; pd_1, partie inférieure, dilatée, de celui-ci; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; ra_1, ra_2, rétracteurs du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent; X, bande conjonctive.

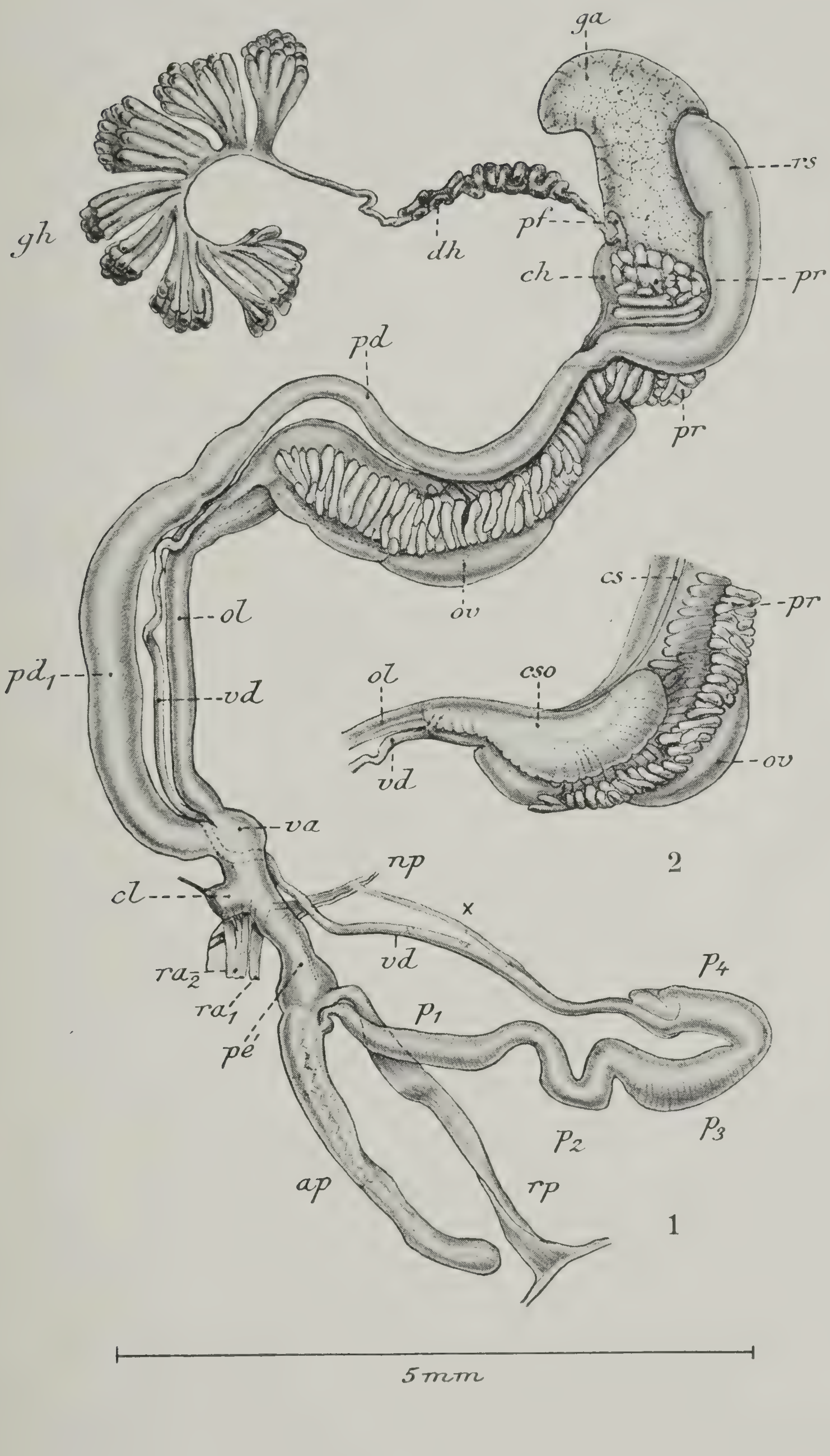

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Planche IX.

Fig. 1. Organes génitaux de *Lauria cylindracea* Da Costa, vus par-dessus.

Fig. 2. Pénis d'un individu jeune de la même espèce, dont l'utérus ne renfermait pas d'embryons.

Les individus reproduits proviennent tous deux du Danemark. L'échelle convient aux deux figures.

ap, ap_1, ap_2, appendice pénien; *cl*, cloaque génital; *dh*, canal hermaphrodite; *ép*, épiphallus; *ép*$_1$, partie moyenne du pénis; *fl*, flagellum; *gh*, glande hermaphrodite; *ol*, oviducte libre; *ov*, oviducte; *pd*, pd_1, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; rp_1, rp_2, ramifications de celui-ci; *rpd*, rétracteur pédieux; *rs*, vésicule de la poche copulatrice; *ut*, utérus; *va*, vagin; *vd*, canal déférent. A droite des lettres *vd* (au-dessus du pénis) court le nerf pénien.

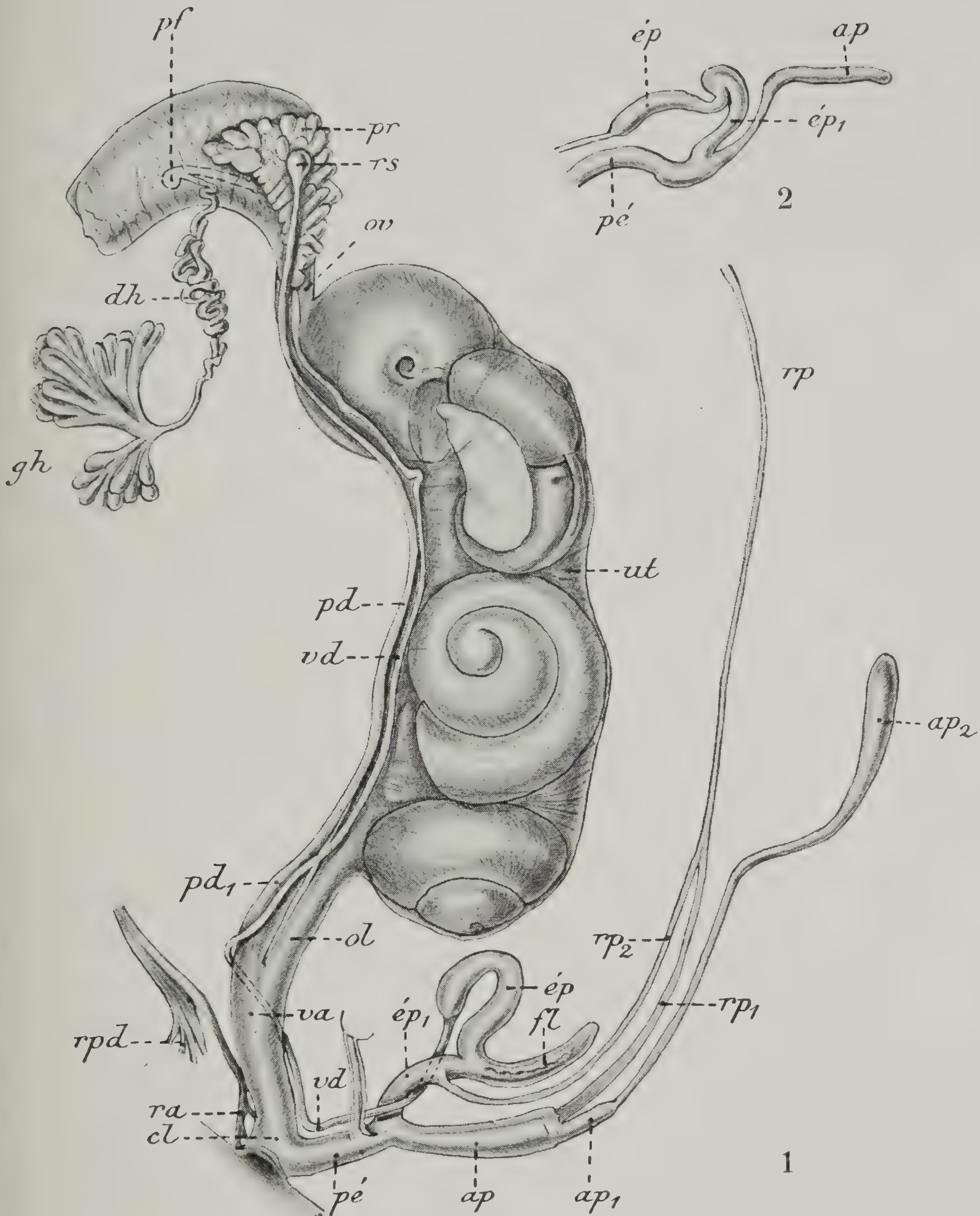
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Planche X.

Fig. 1. Organes génitaux de *Pupilla muscorum* L., vus par-dessus.

Fig. 2 et 3. Poche copulatrice de deux autres individus; la dernière présente deux restes de spermatophores dans le pédoncule et le diverticule.

L'échelle au-dessous de la fig. 1 convient à celle-ci ainsi qu'à la fig. 2.

ap, ap_1, ap_2, appendice pénien; *cl*, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *di*, diverticule de la poche copulatrice; *dp*, diaphragme; *ép*, épiphallus; $ép_1$, partie moyenne du pénis; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ol*, oviducte libre; *pd*, pédoncule de la poche copulatrice; *pé*, pénis (partie distale); *pf*, poche de fécondation; *pr*, prostate; *rp*, rétracteur pénien; rp_1, rp_2, ramifications de celui-ci; *rs*, vésicule de la poche copulatrice; *ut*, utérus; *va*, vagin; *vd*, canal déférent.

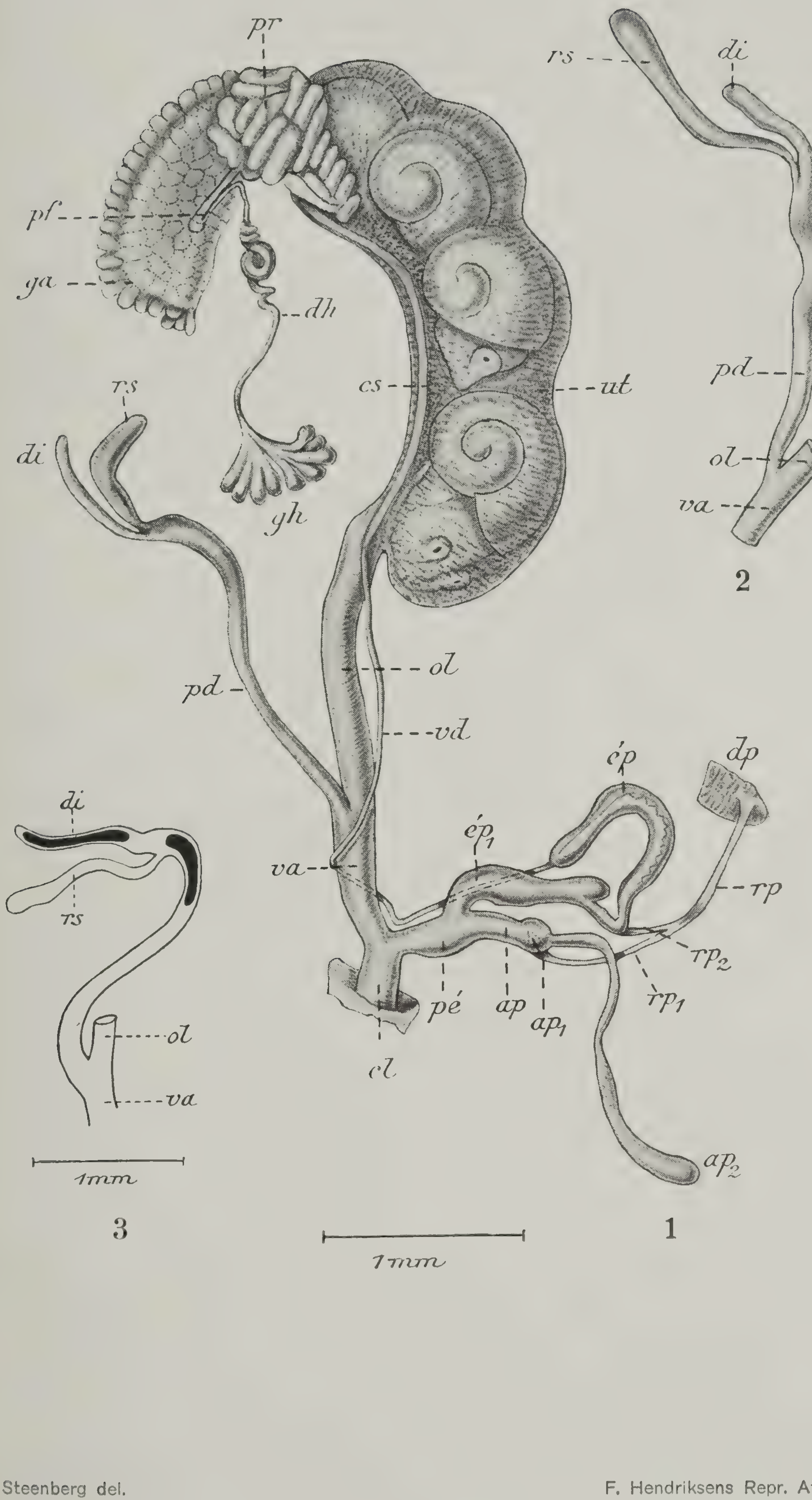

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Planche XI.

Fig. 1. Organes génitaux de *Pupilla triplicata* Stud., vus par-dessus.

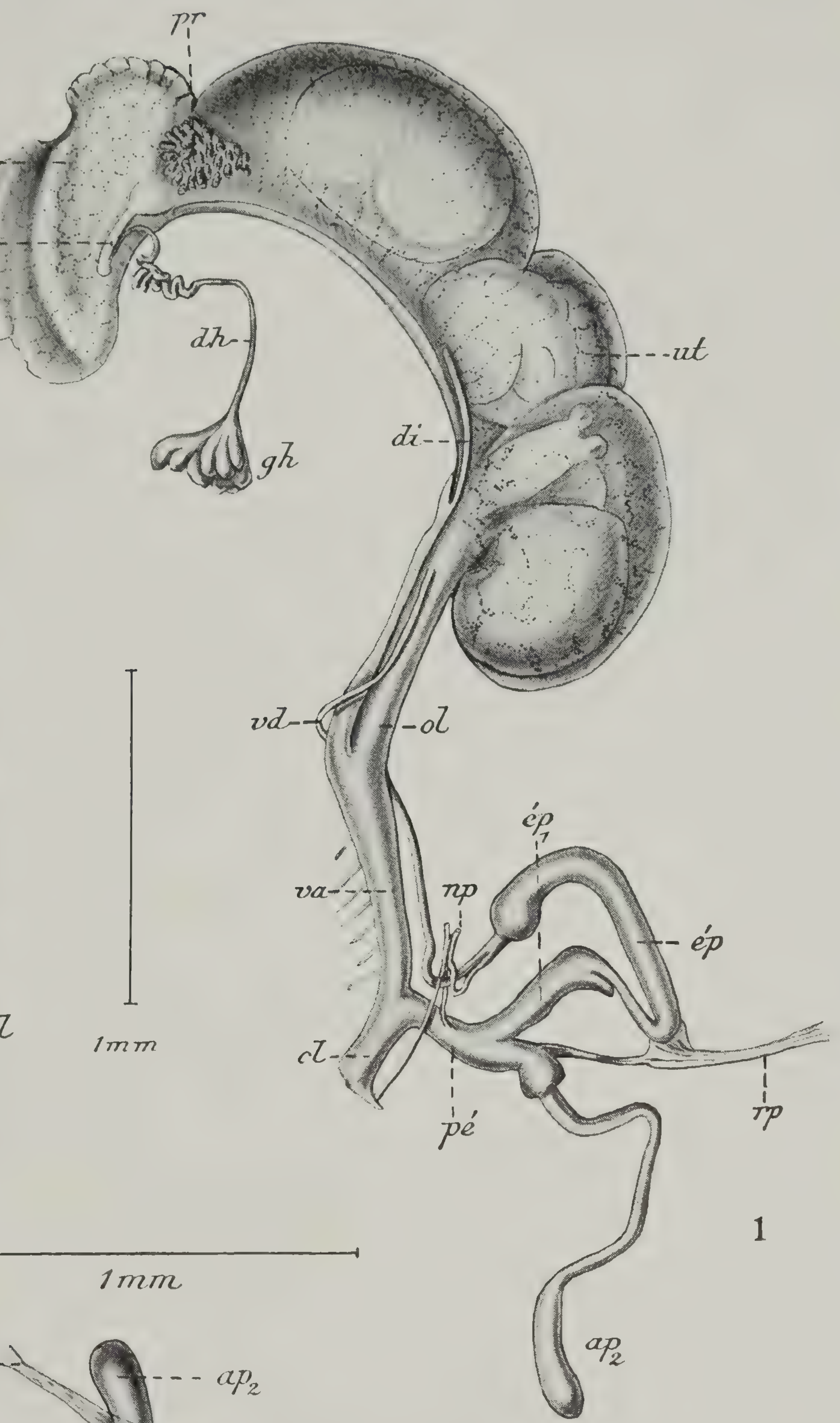
Fig. 2. La poche copulatrice préparée séparément.

Entre les fig. 1 et 2 se voit l'échelle commune.

Fig. 3. Partie distale des conduits excréteurs mâle et femelle de la même espèce. La figure montre le pénis et son appendice dans leur position naturelle. L'échelle correspondante est placée au-dessus de la figure.

Lettres pour les trois figures:

ap_2, appendice pénien; *cl*, cloaque génital; *dh*, canal hermaphrodite; *di*, diverticule de la poche copulatrice; *ép*, épiphallus; $ép_1$, partie moyenne du pénis; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; le long de celui-ci court un autre nerf, aboutissant à la peau comprise entre l'orifice génital et la base de l'ommatophore; *ol*, oviducte libre; *om*, ommatophore; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *ut*, utérus; *va*, vagin; *vd*, canal déférent.



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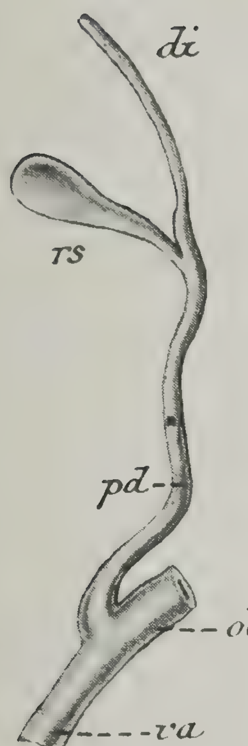

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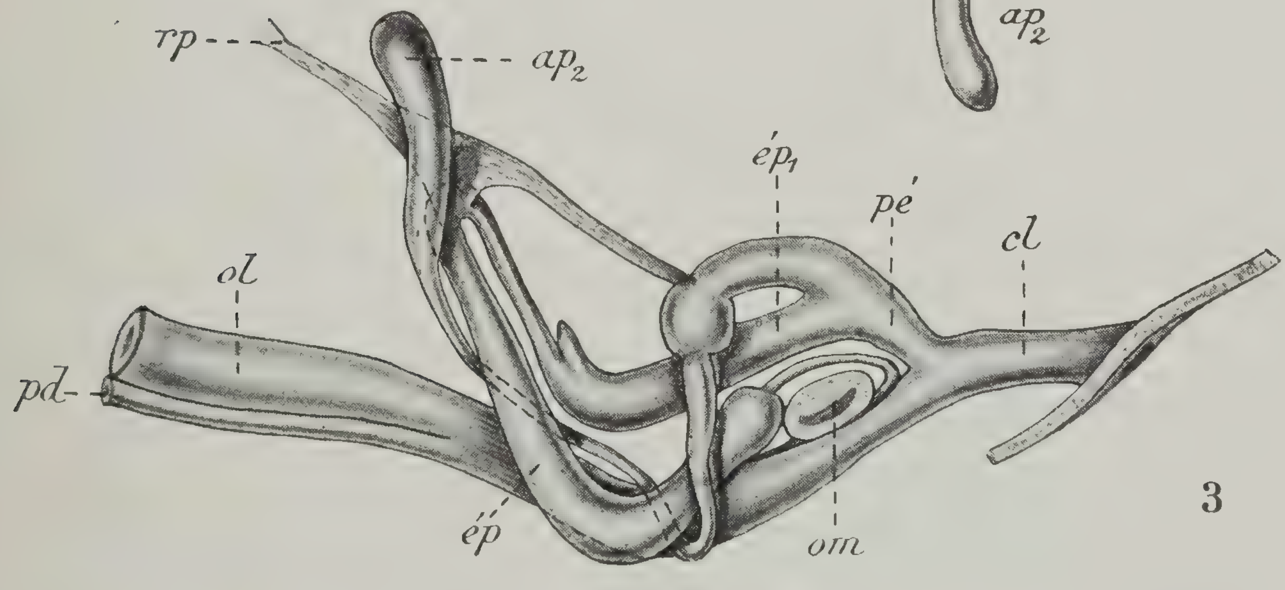

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Planche XII.

Fig. 1. Organes génitaux de *Pupilla cupa* var. (?) *sterri* Voith, vus par-dessus. L'échelle se trouve au-dessous de la figure.

ap, ap_2, appendice pénien; *cl*, cloaque génital; *dh*, canal hermaphrodite; *di*, diverticule de la poche copulatrice; *ép*, épiphallus; $ép_1$, partie moyenne du pénis; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ol*, oviducte libre; *pé*, pénis (partie distale); *pf*, poche de fécondation; *pr*, prostate; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *ut*, utérus; *va*, vagin; *vd*, canal déférent.

Fig. 2. Poche copulatrice d'un autre individu, dont la vésicule contient les restes d'un spermatophore. L'échelle se trouve du côté gauche de la figure.

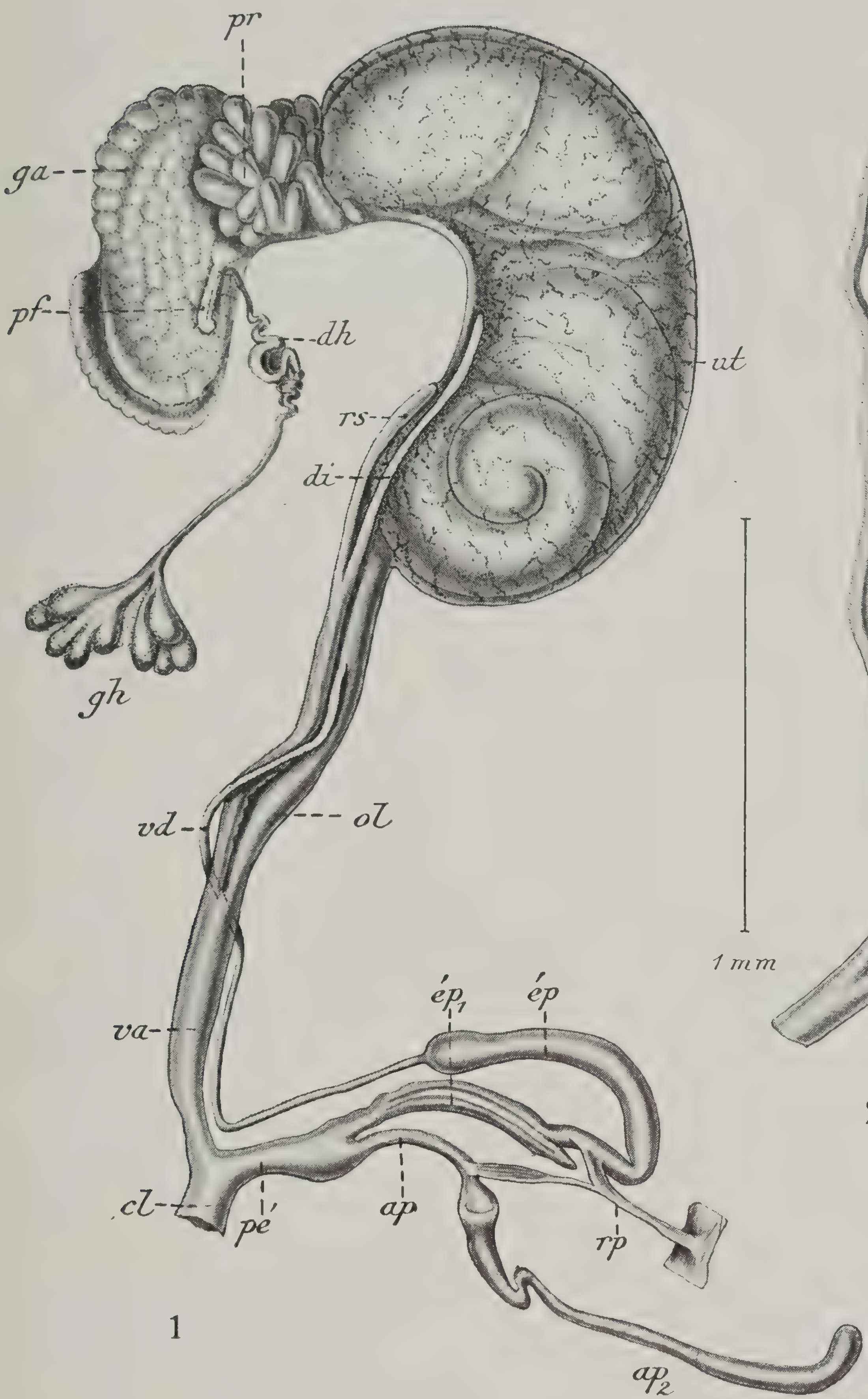

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Planche XIII.

Fig. 1. Organes génitaux de *Pupilla cupa* Jan., vus par-dessus.

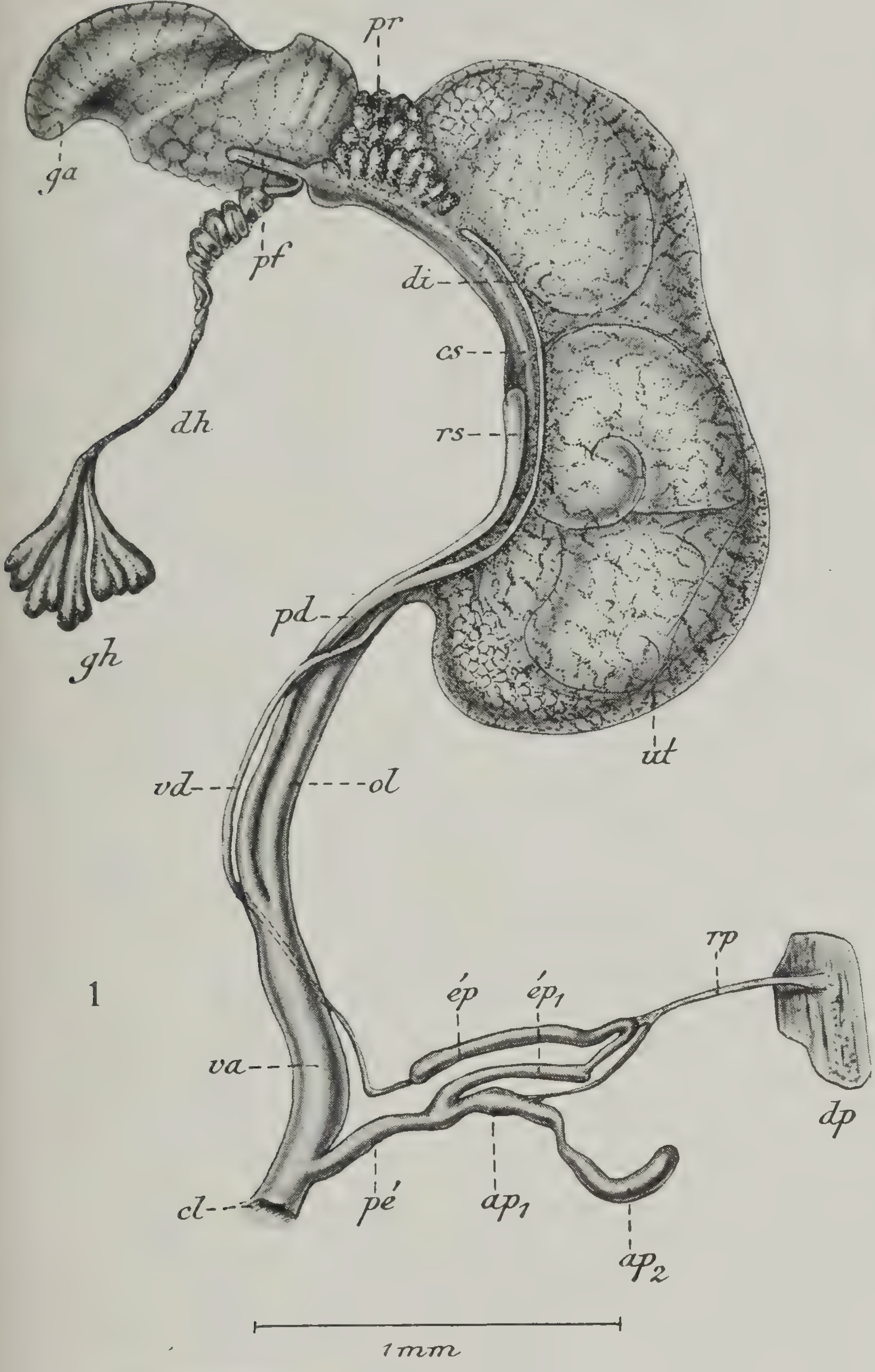
Fig. 2 et 3. Poche copulatrice de deux autres individus. L'échelle à droite de la fig. 2 s'applique à celle-ci ainsi qu'à la fig. 3.

Les lettres suivantes conviennent aux fig. 1—3:

ap_1, ap_2, appendice pénien; *cl*, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *di*, diverticule de la poche copulatrice; *dp*, diaphragme; *ép*, épiphallus; $ép_1$, partie moyenne du pénis; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ol*, oviducte libre; *pd*, pédoncule de la poche copulatrice; *pé*, pénis (partie distale); *pf*, poche de fécondation; *pr*, prostate; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *ut*, utérus; *va*, vagin; *vd*, canal déférent.

Fig. 4. Embryon de *Pupilla cupa* var. (?) *sterri* Voith, retiré de l'utérus; il est encore enveloppé de sa coquille d'œuf, *co*.

Fig. 5. Mâchoire de *Pupilla muscorum* L.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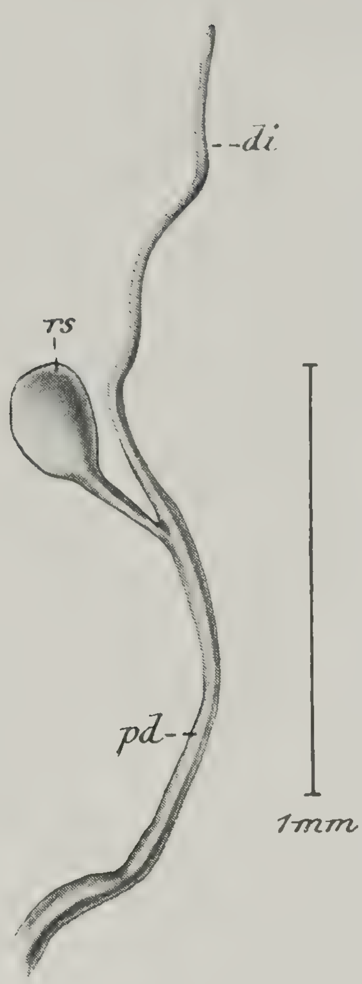
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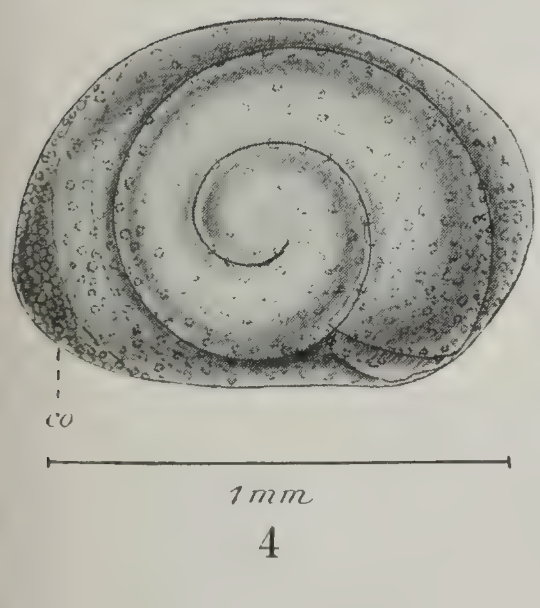
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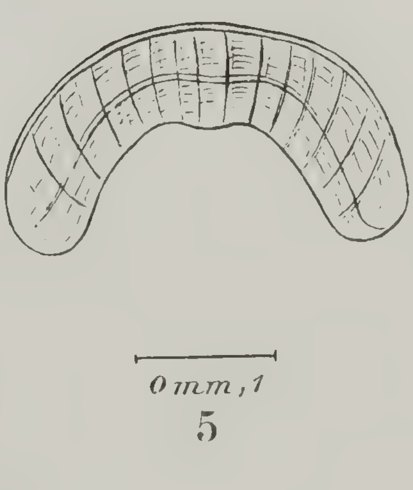
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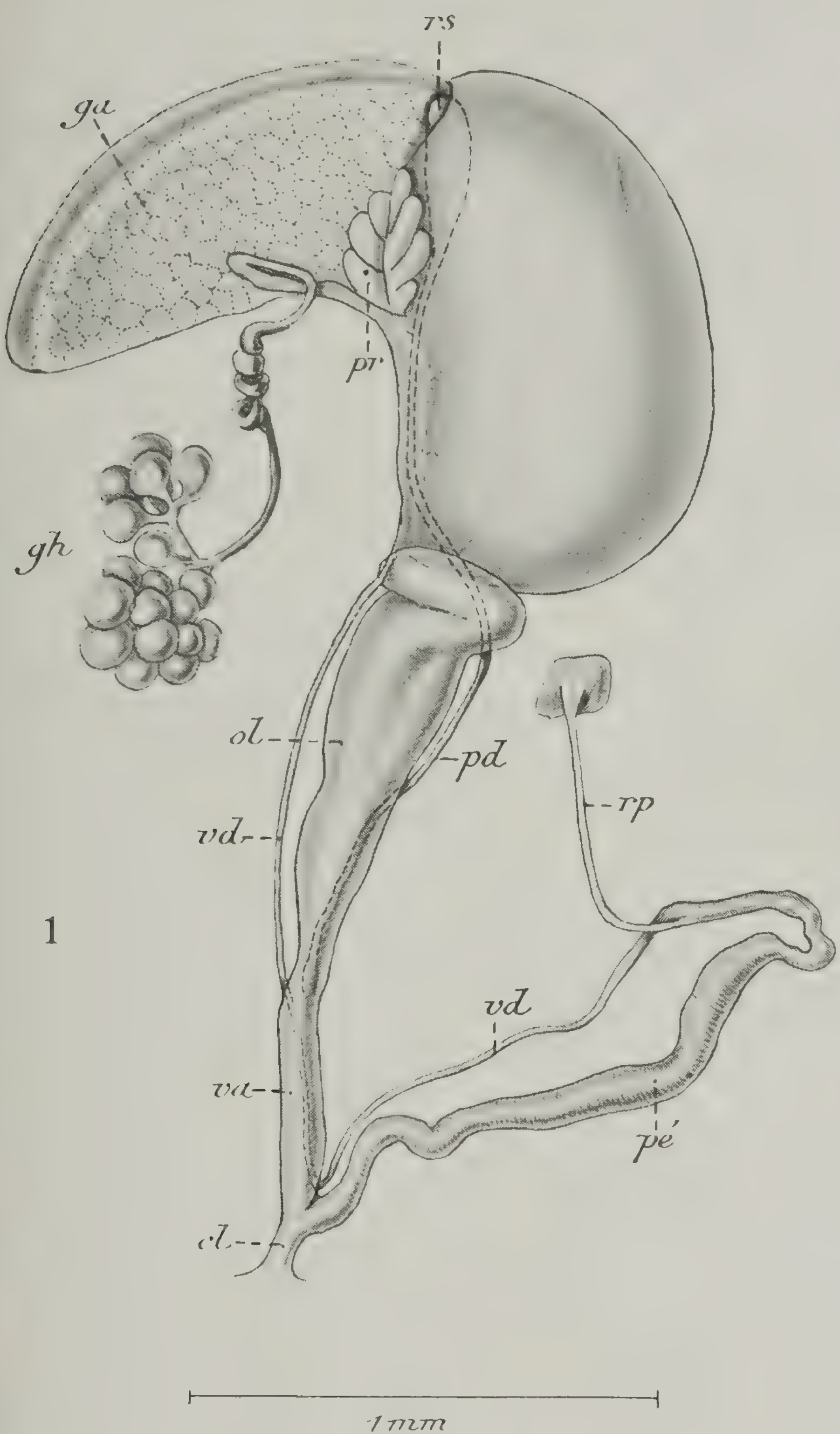
Planche XIV.

Fig. 1. Organes génitaux de *Vertigo moulinsiana* Dup., vus par la face supérieure.

cl, cloaque génital; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ol*, oviducte libre; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pr*, prostate; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

Fig. 2. Plafond de la cavité pulmonaire avec ses organes chez *Lauria cylindracea* Da Costa.

Fig. 3. Exemplaire du *Vertigo pygmæa* Drap., fixé, le pénis renversé (voir pl. XVI fig. 5).



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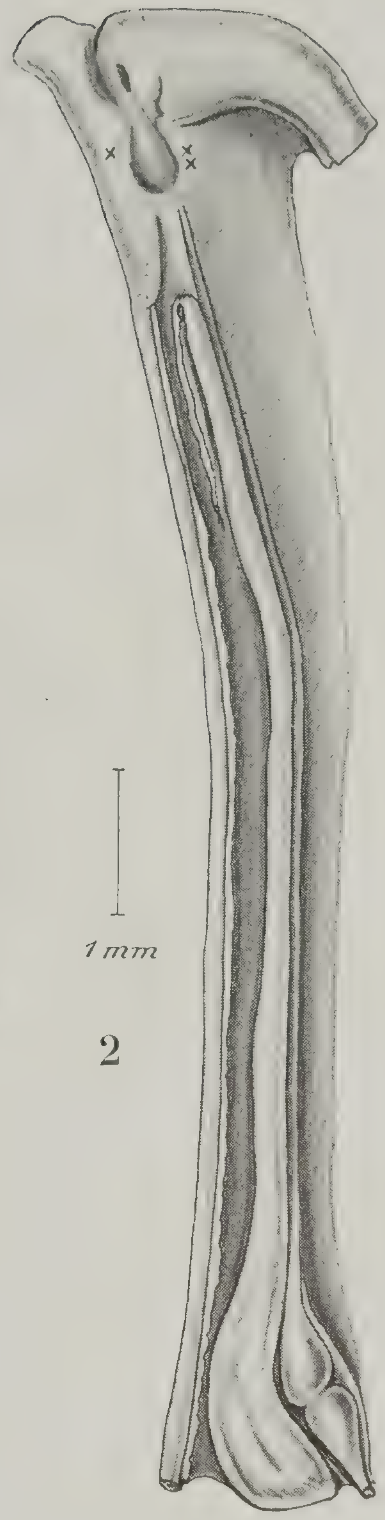

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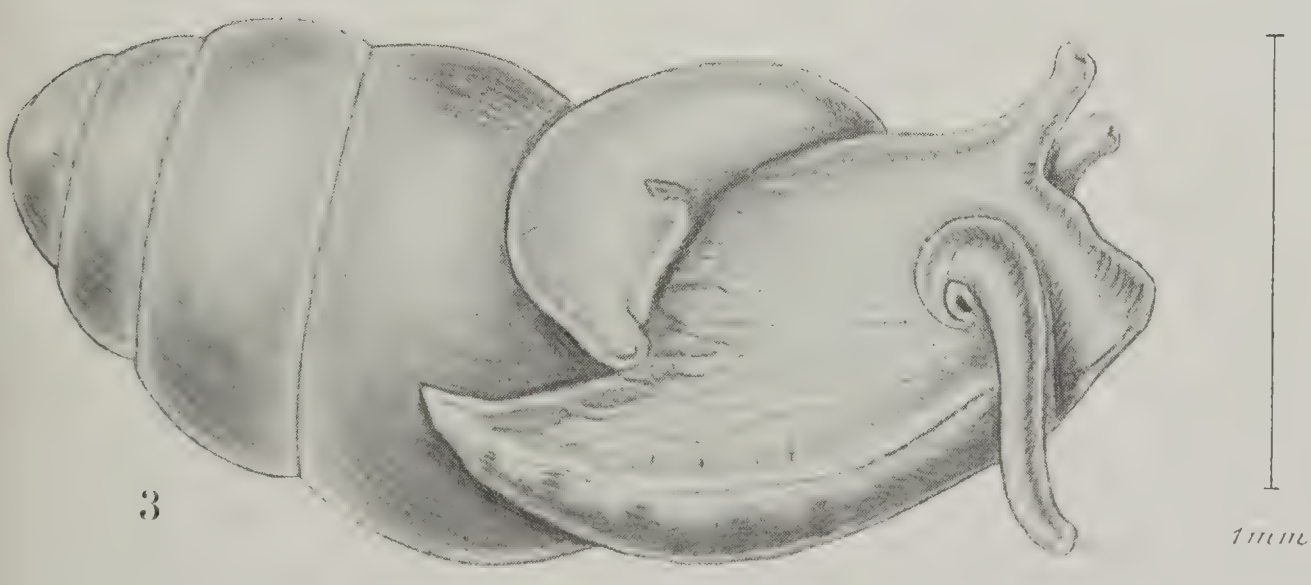

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Planche XV.

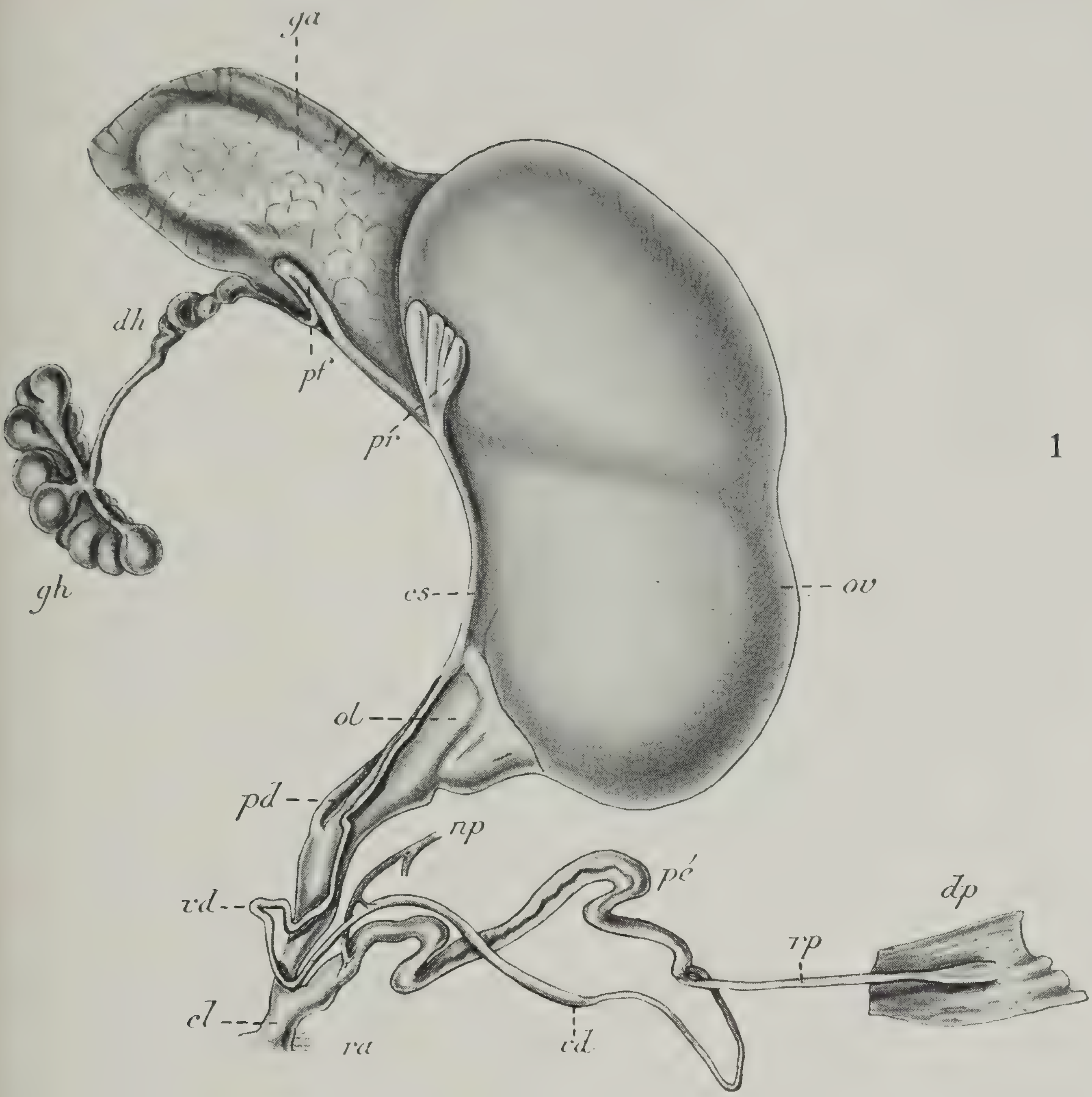
Fig. 1. Organes génitaux de *Vertigo moulinsiana* Dup., vus par-dessus. L'oviducte s'est un peu gonflé pendant la préparation.

Fig. 2. Poche copulatrice d'un autre individu de la même espèce; la figure montre sa position dans le sillon entre la glande albuminipare et l'oviducte.

Fig. 3. Poche de fécondation et prostate du même individu.

Les désignations suivantes s'appliquent aux fig. 1—3:

cl, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *dp*, diaphragme; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *gi*, emplacement de l'intestin dans la glande albuminipare; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *vd*, canal déférent.



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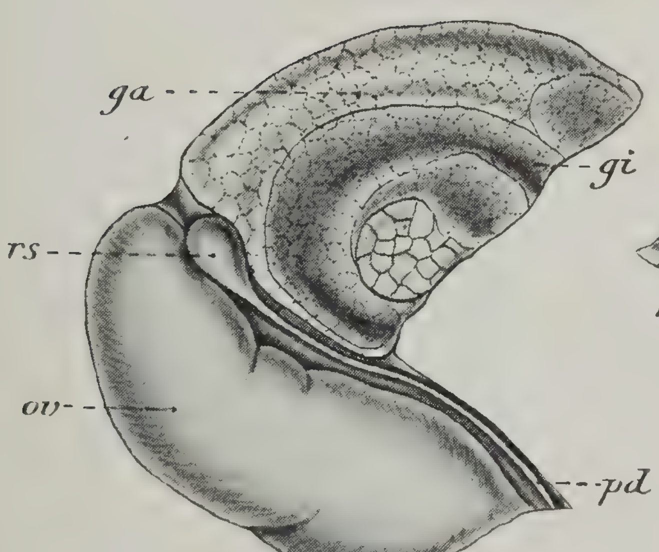

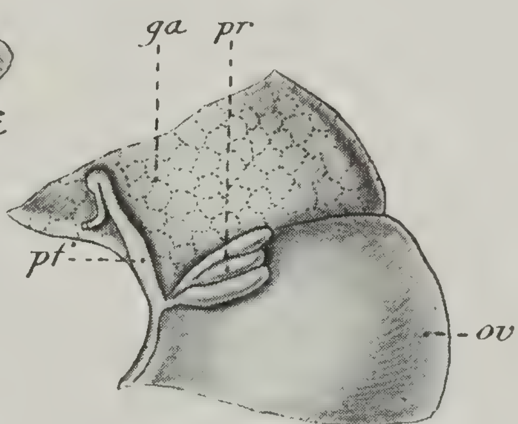

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Planche XVI.

Fig. 1. Organes génitaux de *Vertigo moulinsiana* Dup., vus par la face inférieure.

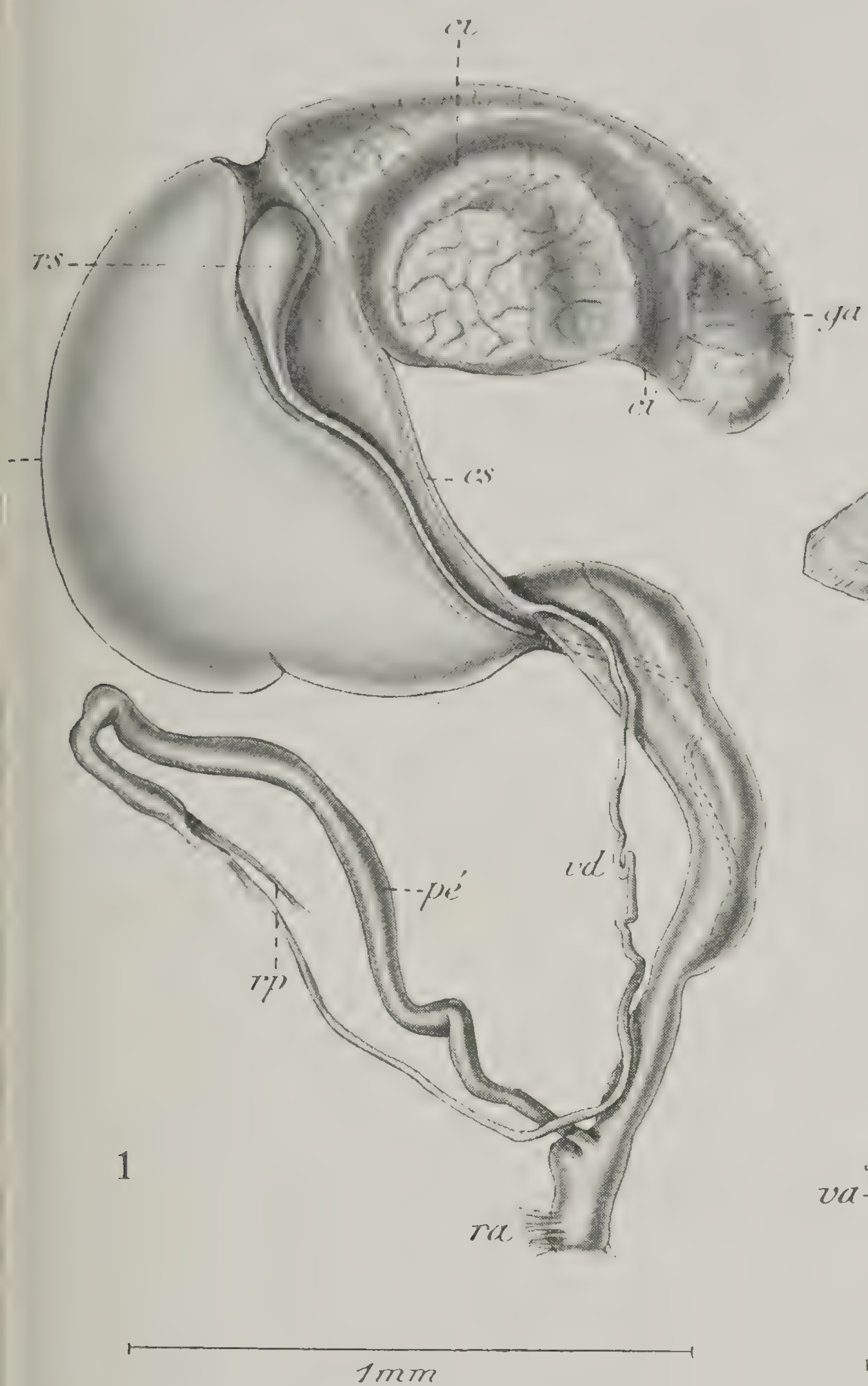
Fig. 2 et 3. Deux coupes transversales de ces organes, montrant la structure intérieure du spermoviducte et de l'oviducte libre; dans la fig. 2, la coupe a été menée à travers le spermoviducte, dans la fig. 3, à travers la partie supérieure de l'oviducte libre, tout près du lieu d'accès du canal déférent, du côté distal. Elles sont vues toutes deux du côté apical.

Fig. 4. Pénis de *Vertigo substriata* Jeffr.; individu d'Irlande.

Fig. 5. Organes copulateurs mâles de *Vertigo pygmæa* Drap. L'individu a été fixé, ayant le pénis renversé (voir pl. XIV, fig. 3).

Les désignations suivantes s'appliquent aux figures 1 à 5:

ci, sillon de la glande albuminipare où est logé l'intestin; *cl*, cloaque génital; *cs*, canal séminal; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *ol*, oviducte libre; ol_1, partie repliée de celui-ci, semblable à un cul-de-sac; *ov*, oviducte; *o.va*, ouverture conduisant dans le vagin; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.



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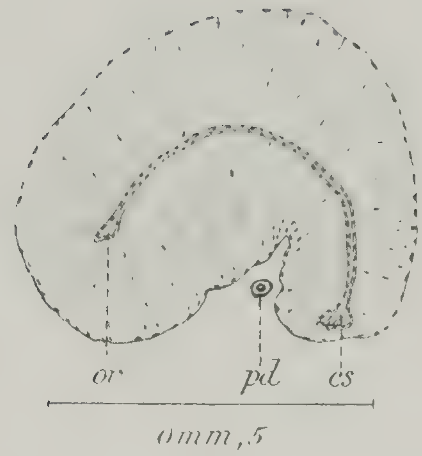

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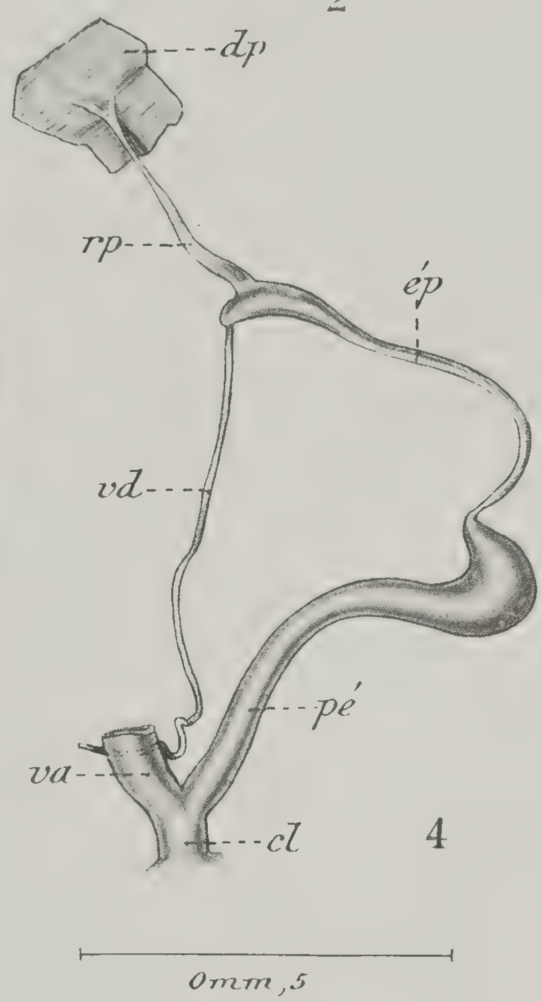

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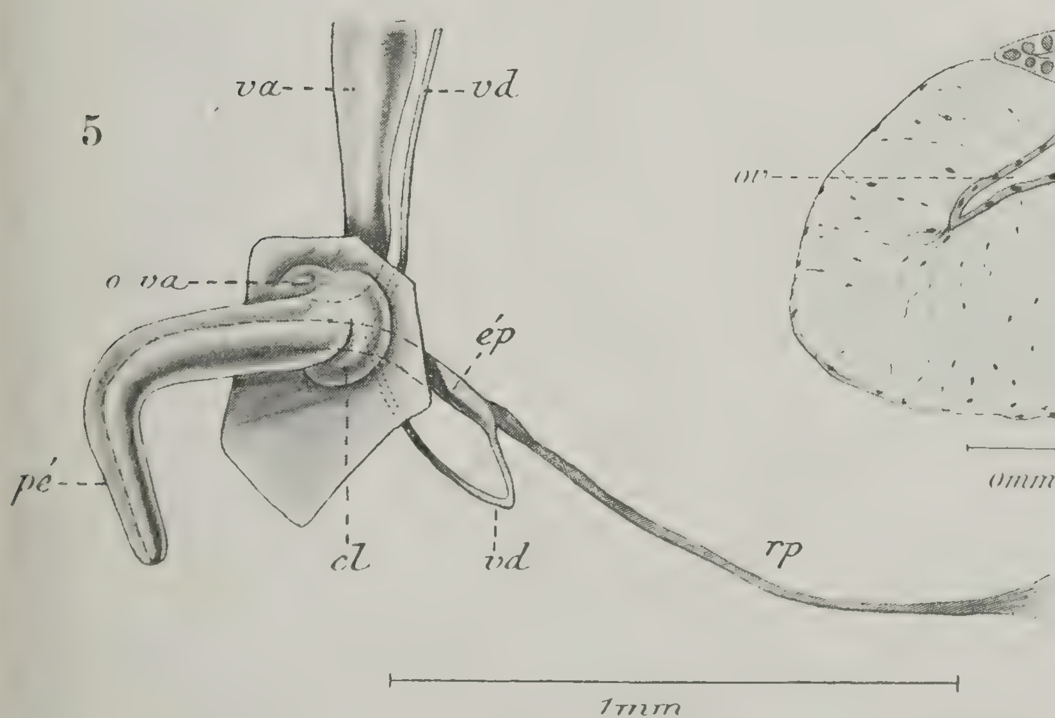

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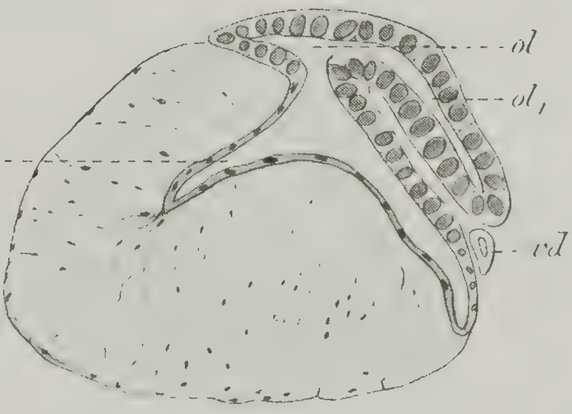

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16*

Planche XVII.

Organes génitaux de *Vertigo pygmæa* Drap., vus par la face supérieure.

ci, sillon du foie, où est logé l'intestin; *cl*, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; *pé*, pénis (partie distale); $pé_1$, section moyenne du pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

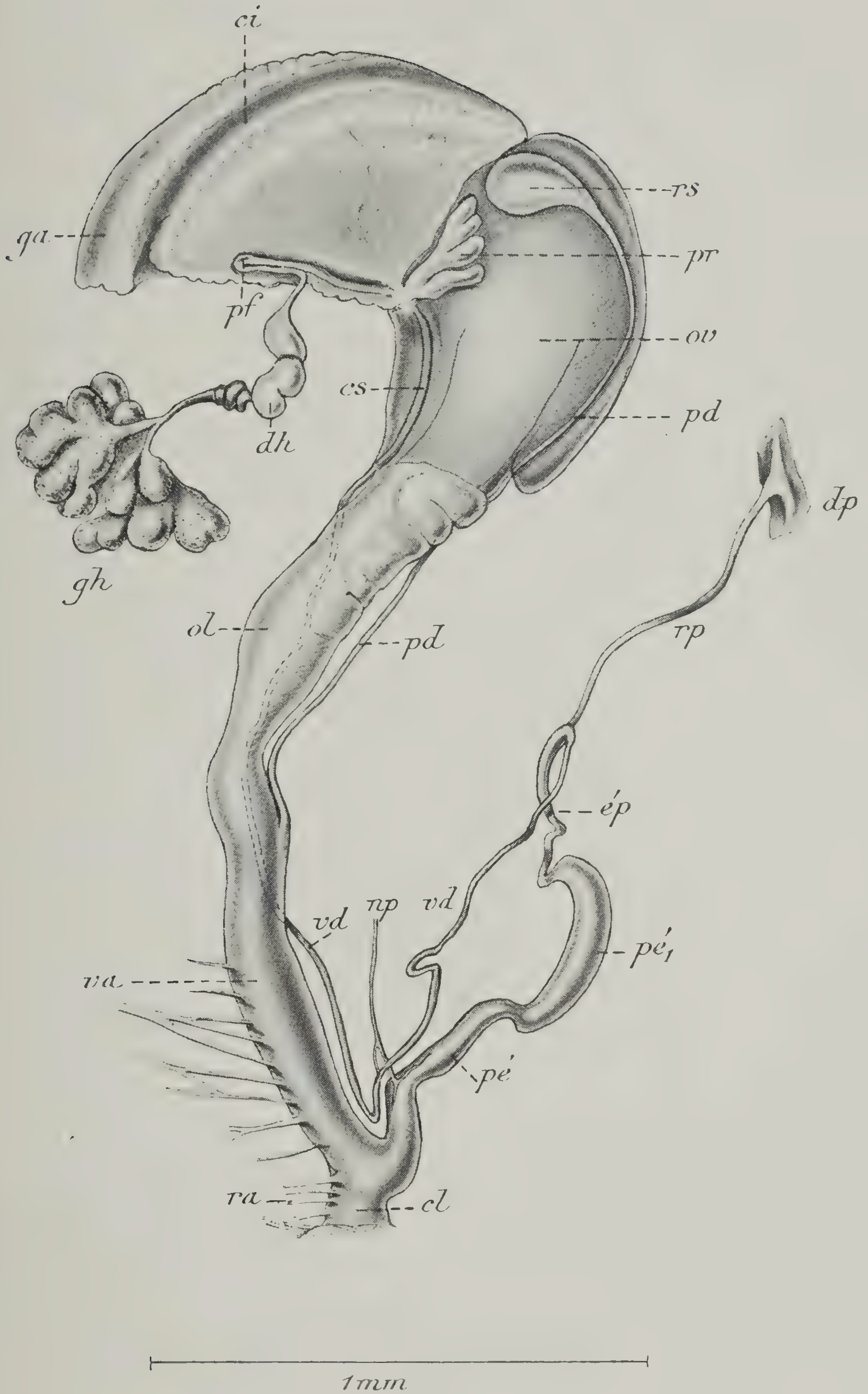
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Planche XVIII.

Fig. 1. Organes génitaux de *Vertigo antivertigo* Drap., vus par-dessus. L'individu est entièrement étendu.

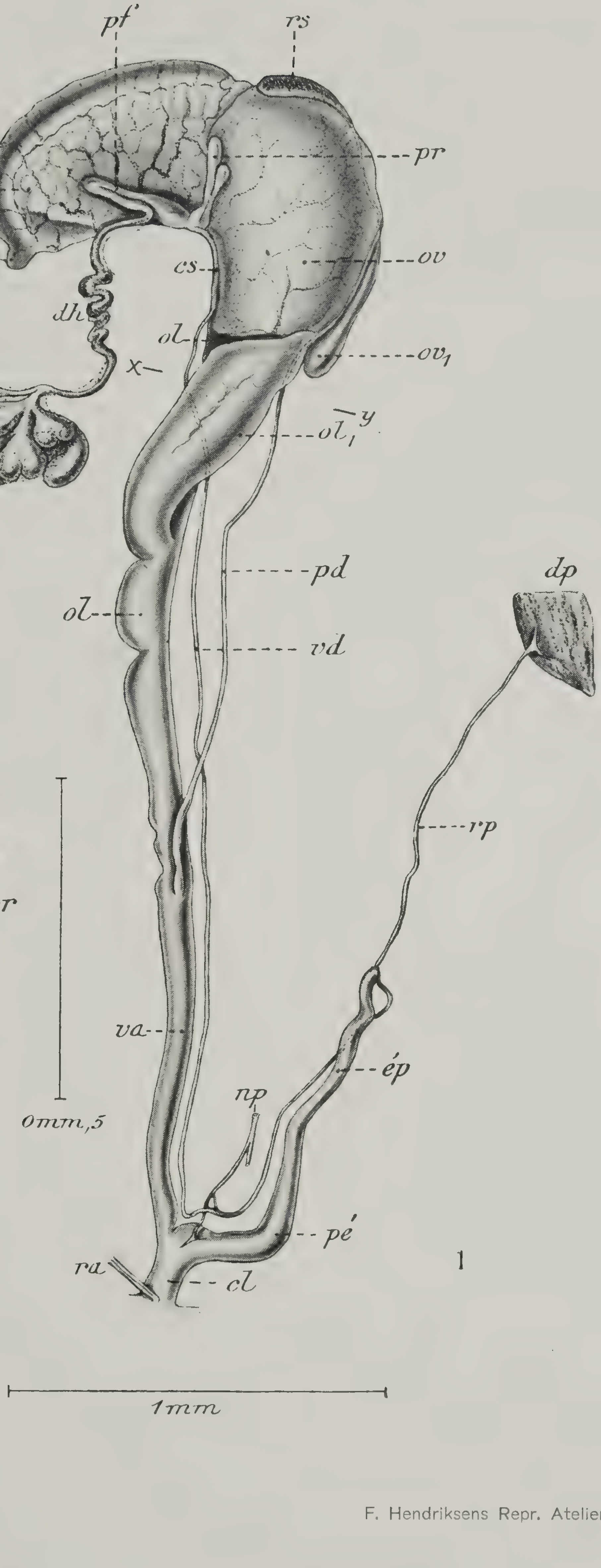
Fig. 2. Poche de fécondation et prostate d'un autre individu.

Fig. 3. Coupe transversale de l'oviducte libre. La direction dans laquelle elle a été menée est indiquée par les lettres x-y de la fig. 1.

L'échelle placée verticalement s'applique aux fig. 2 et 3.

Les lettres suivantes conviennent aux trois figures:

ch, partie inférieure, dilatée, de la poche de fécondation, qui se continue dans le canal séminal; *cl*, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, ol_1, oviducte libre; *ov*, ov_1, oviducte; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.



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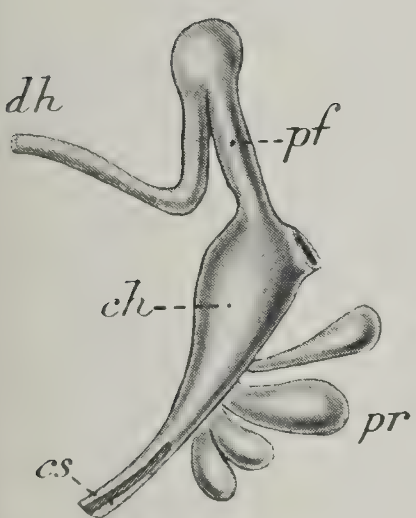

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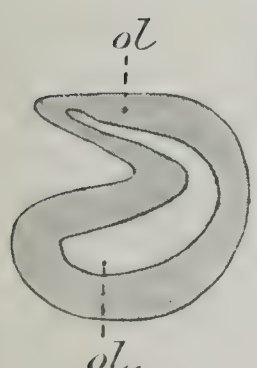

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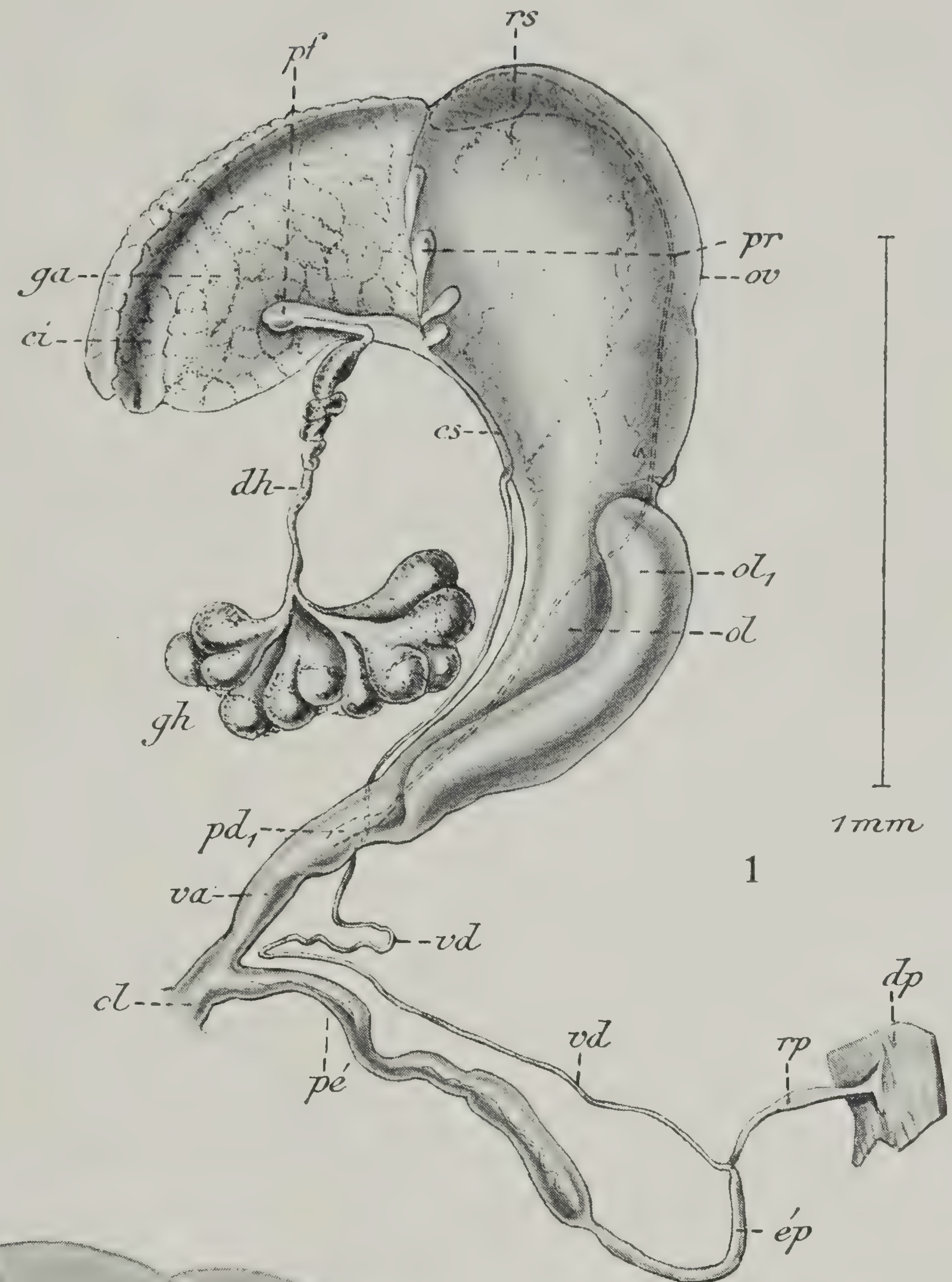
Planche XIX.

Fig. 1. Organes génitaux de *Vertigo antivertigo* Drap., vus par-dessus. L'individu est fortement contracté.

ci, sillon de la glande albuminipare, où est logé l'intestin; *cl*, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *ol*, ol_1, oviducte libre; *ov*, oviducte; pd_1, partie basilaire, dilatée, du pédoncule de la poche copulatrice (pointillée); *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice (pointillée); *va*, vagin; *vd*, canal déférent.

Fig. 2. Poche copulatrice de la même espèce; grossissement comme dans la figure précédente.

Fig. 3. *Pupilla cupa* Jan. La figure montre la position de l'orifice génital; une partie du cloaque génital a été renversée.



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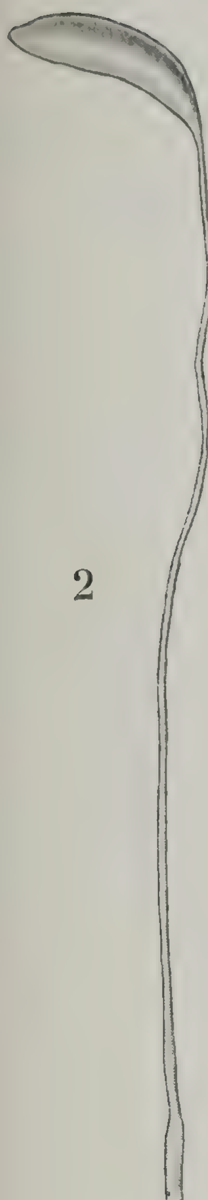

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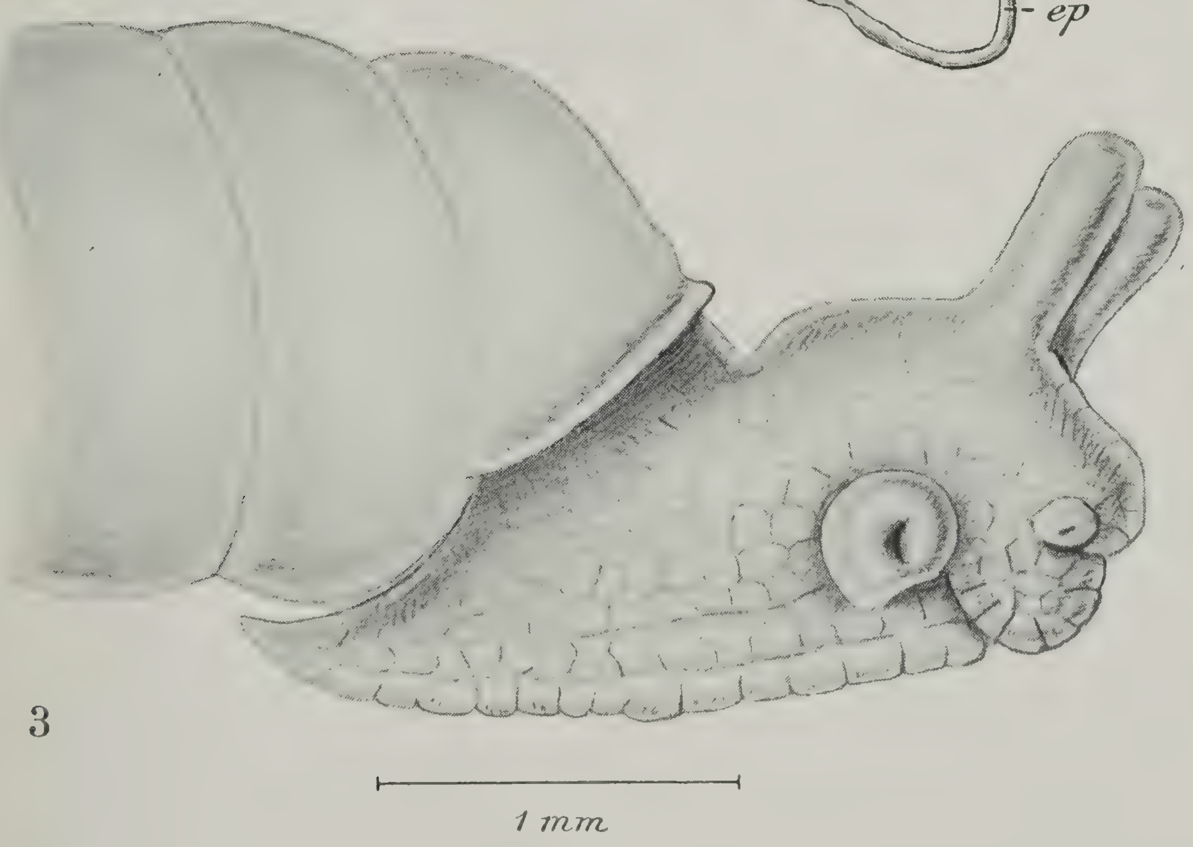

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Planche XX.

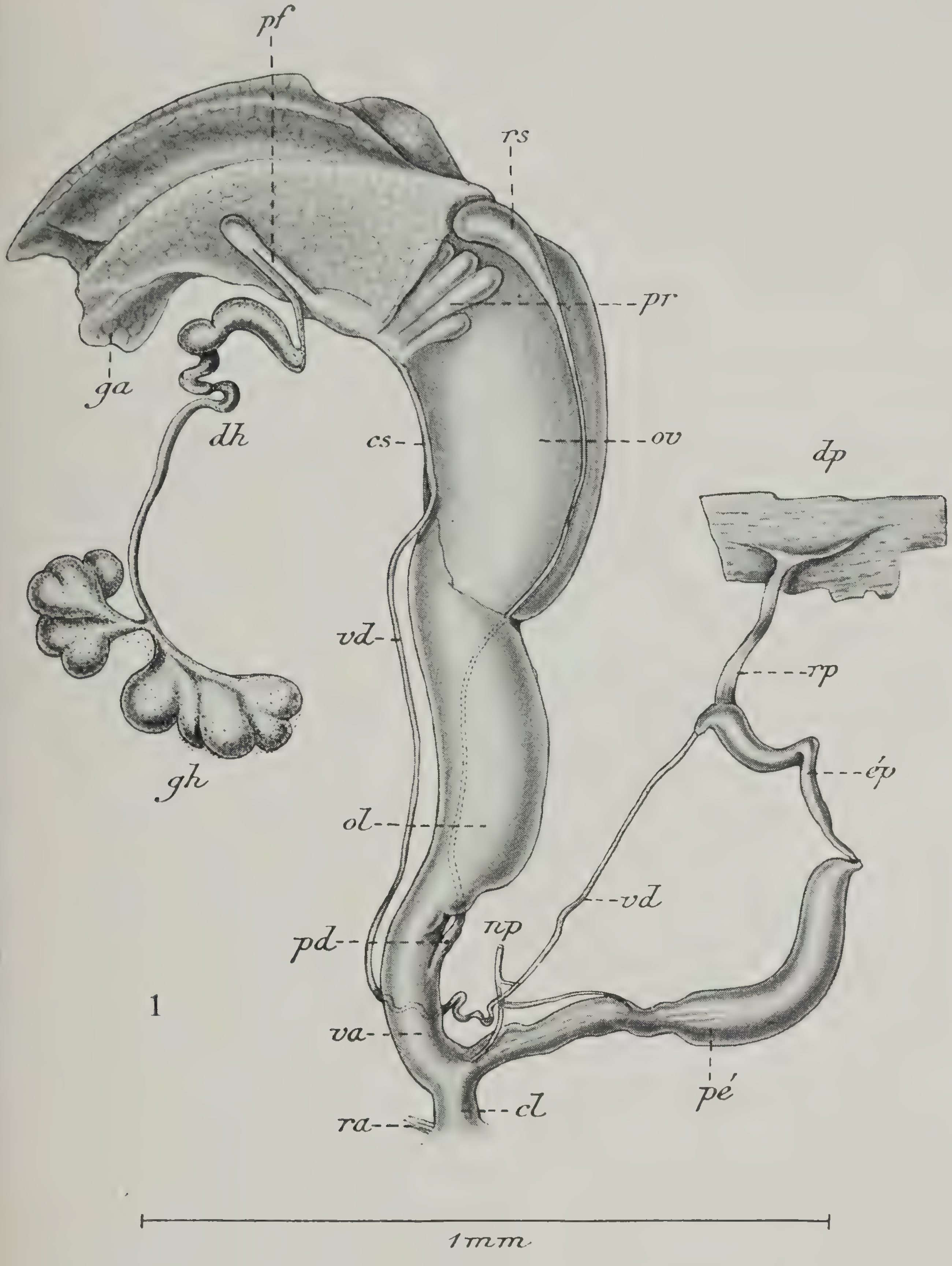
Fig. 1. Organes génitaux de *Vertigo substriata* Jeffr., vus par la face dorsale. L'exemplaire provient de Seeland.

cl, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

L'ommatophore passe le pénis à l'endroit où celui-ci présente un rétrécissement (à gauche des lettres *pé*).

Fig. 2. Mâchoire de *Lauria cylindracea* D. C.

Fig. 3. Mâchoire de *Vertigo pusilla* Müll.



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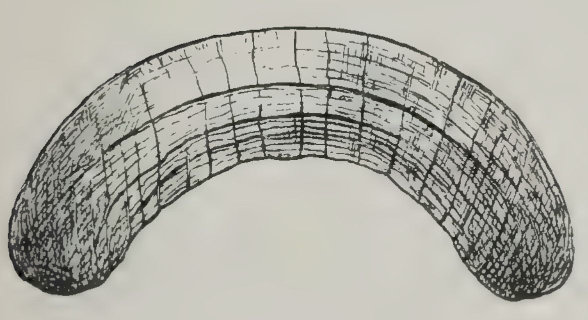

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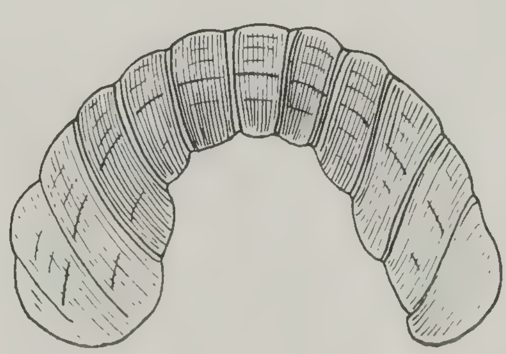

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Planche XXI.

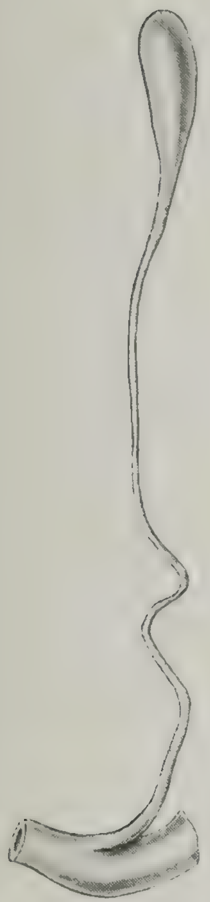
Fig. 1. Organes génitaux de *Vertigo pusilla* Müll., vus par-dessus. *cl*, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent; celui-ci est en général fixé à l'oviducte libre à l'aide de tissu conjonctif; dans l'exemplaire figuré il en a cependant été détaché.

Fig. 2. Poche copulatrice d'un autre individu, préparée séparément.

Même échelle pour les fig. 1 et 2.

Fig. 3. Mâchoire de *Nesopupa moreleti* Brown.

Fig. 4. Mâchoire d'*Acanthinula (Zoogenetes) harpa* Say.



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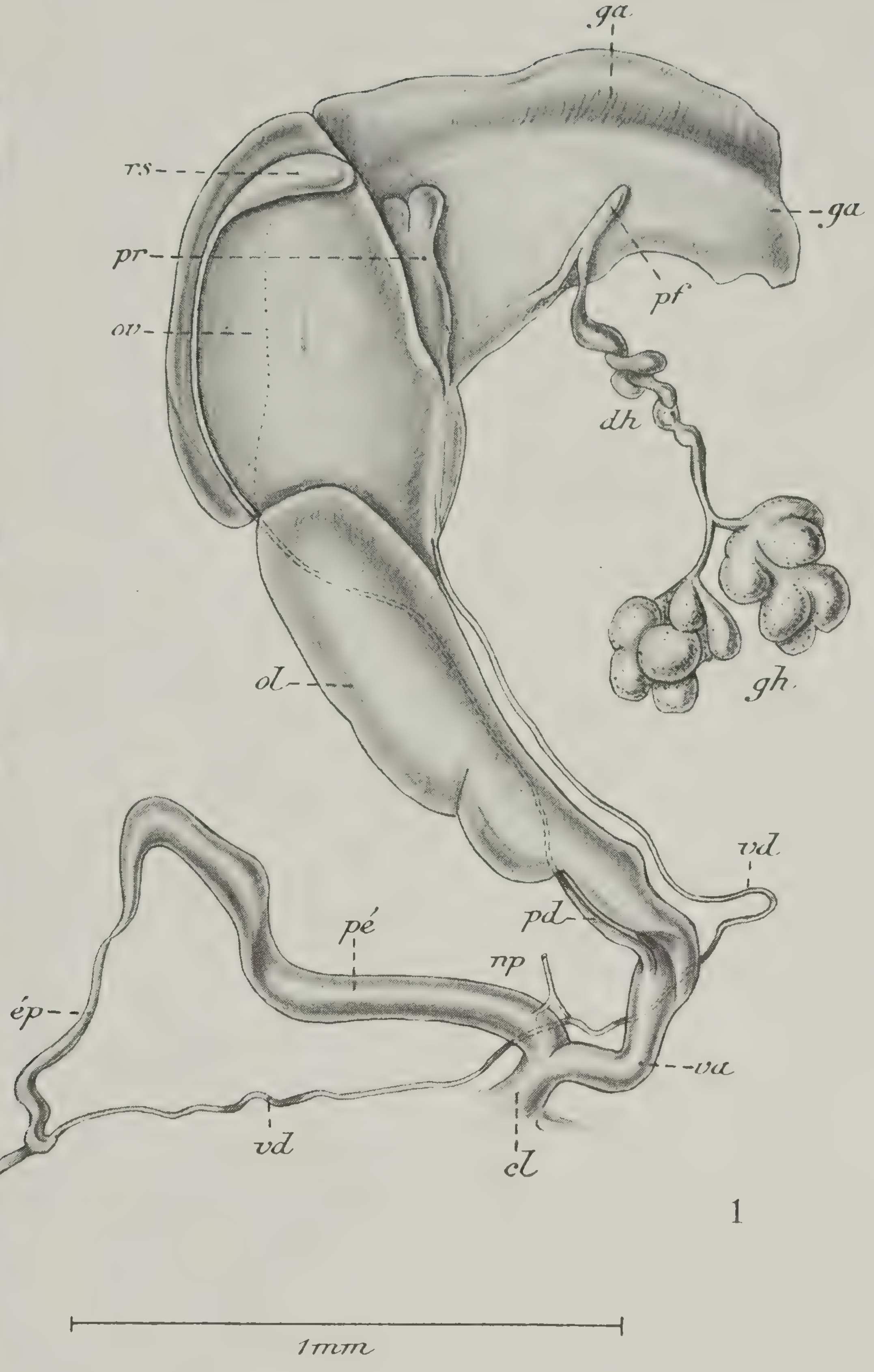

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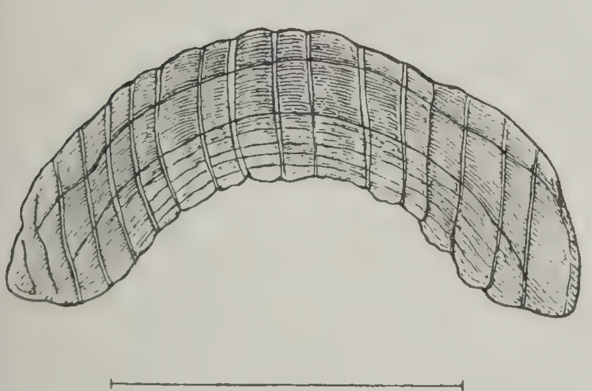

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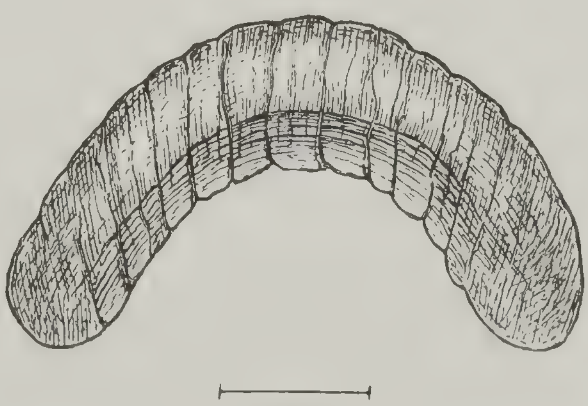

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Planche XXII.

Fig. 1. Organes génitaux de *Vertigo angustior* Jeffr., vus par la face supérieure.

La poche de fécondation est mise à découvert, et le canal déférent a été détaché dans tout le parcours entre les deux signes ⊣.

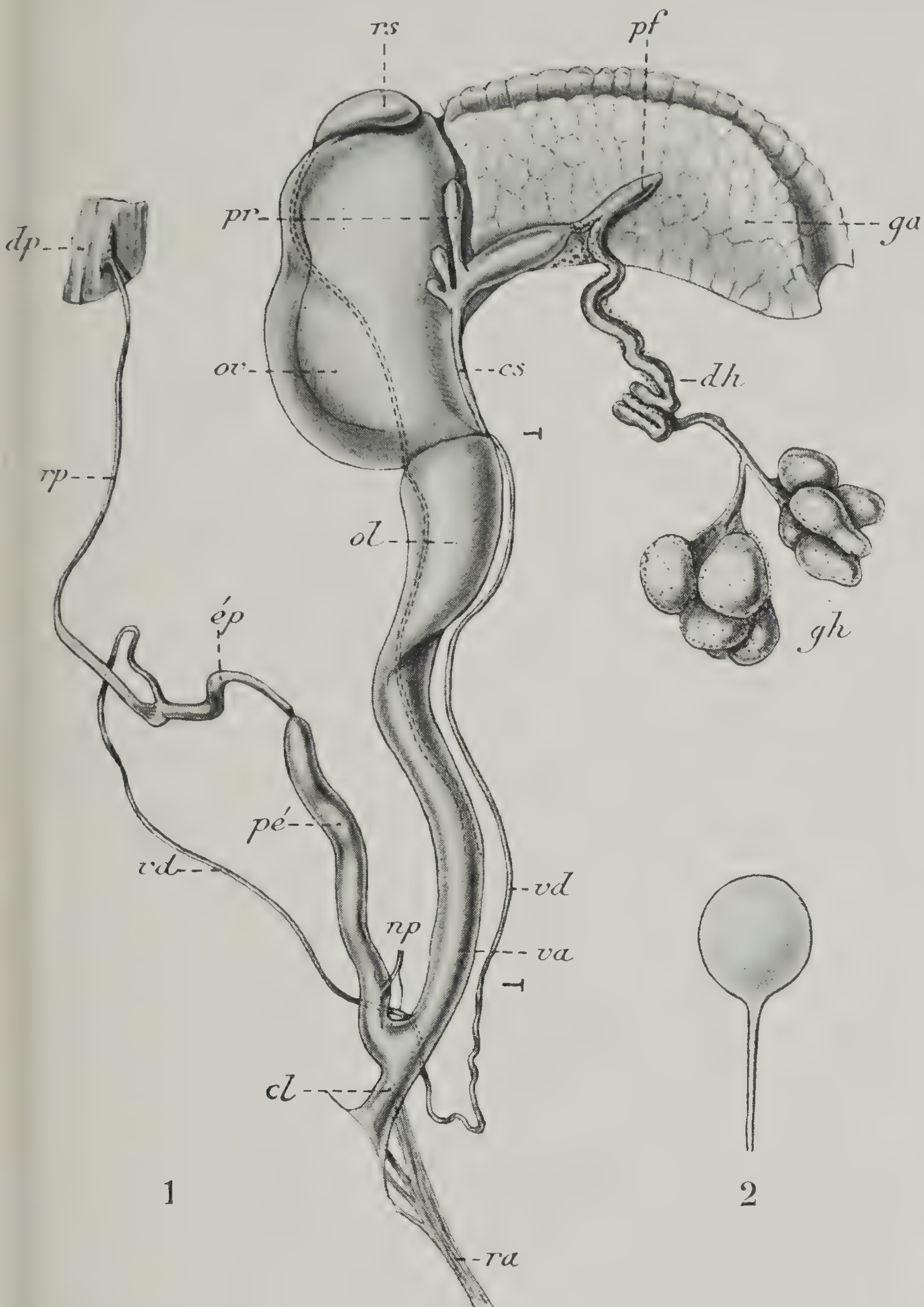
cl, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pé*, pénis; *pf*, poche de fécondation; *pr*, prostate; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

Fig. 2. Partie distale de la poche copulatrice d'un autre individu qui manquait de pénis.

Même grossissement pour les figures 1 et 2.

Fig. 3. Poche copulatrice d'un autre individu.

Fig. 4—6. Glandes salivaires d'*Acanthinula harpa* Say; fig. 4, celle de gauche; fig. 5, celle de droite; fig. 6, les deux glandes dans leur position naturelle par rapport l'une à l'autre. L'œsophage ne se trouve pas dessiné dans les figures. Dans la fig. 5 s'observe la dépression en forme de rainure dans laquelle il a été logé. On voit que la partie proximale des voies d'excrétion part du bord antérieur des glandes.



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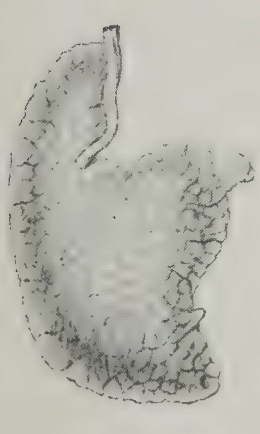
3

1mm



1mm

4 5 6

Planche XXIII.

Fig. 1. Organes génitaux de *Truncatellina rivierana* Bens., vus par-dessus.

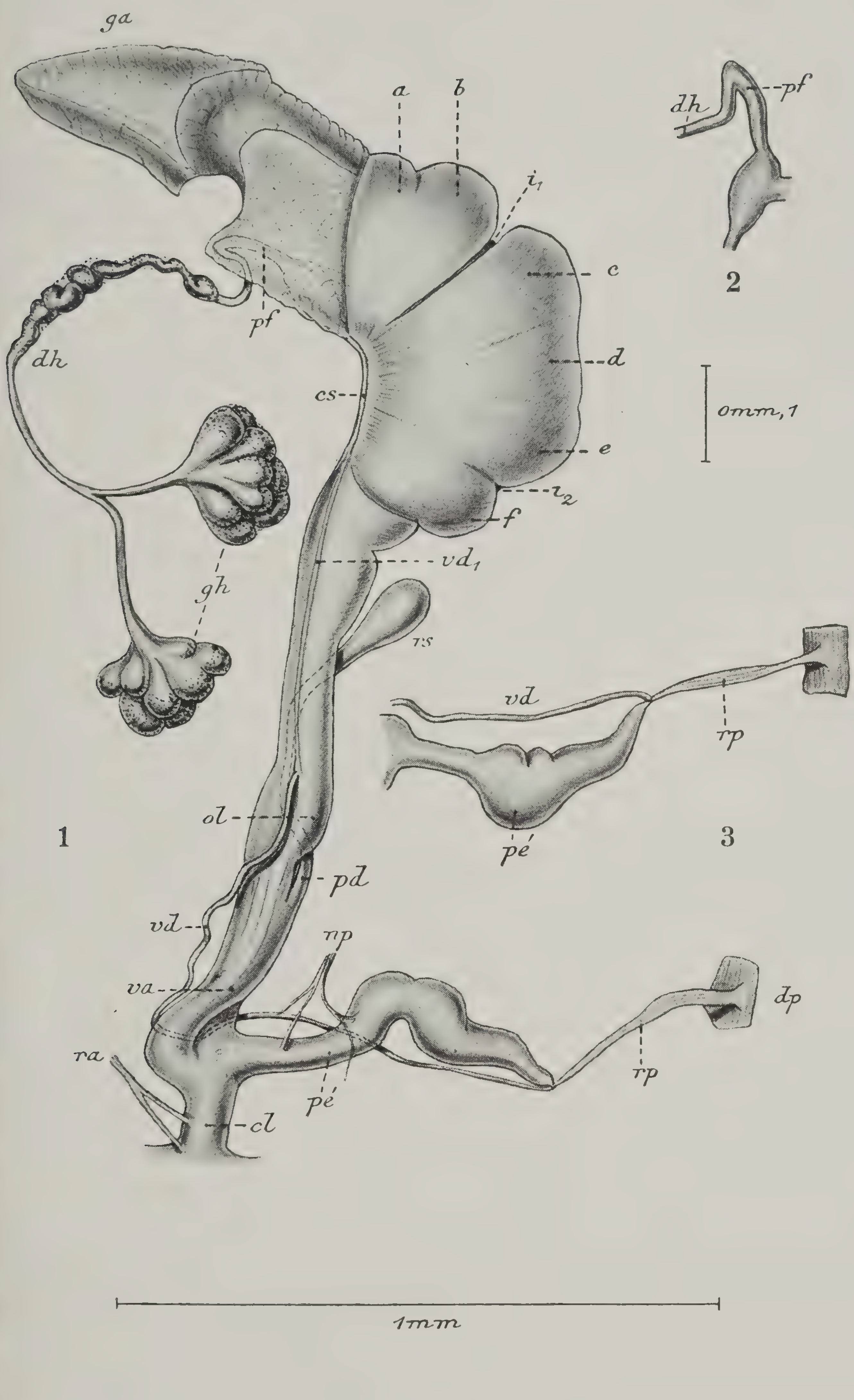
Fig. 2. La poche de fécondation préparée séparément. L'échelle qui y correspond (0 mm,1) se trouve au-dessous de la figure.

Fig. 3. Pénis d'un autre individu.

La grande échelle (1 mm) est commune aux figures 1 et 3.

Les lettres suivantes conviennent aux trois figures:

a-f, les différents replis de l'oviducte; *cl*, cloaque génital; *cs*, canal séminal; *dh*, canal hermaphrodite; *dp*, diaphragme; *ga*, glande albuminipare avec un sillon profond pour l'intestin; *gh*, glande hermaphrodite; i_1, i_2, deux incisions sur le côté extérieur de l'oviducte; *np*, nerf pénien; *ol*, oviducte libre; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *ra*, rétracteur du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent; vd_1, partie du canal déférent, enchâssée dans la paroi de l'oviducte libre.


ga
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1mm

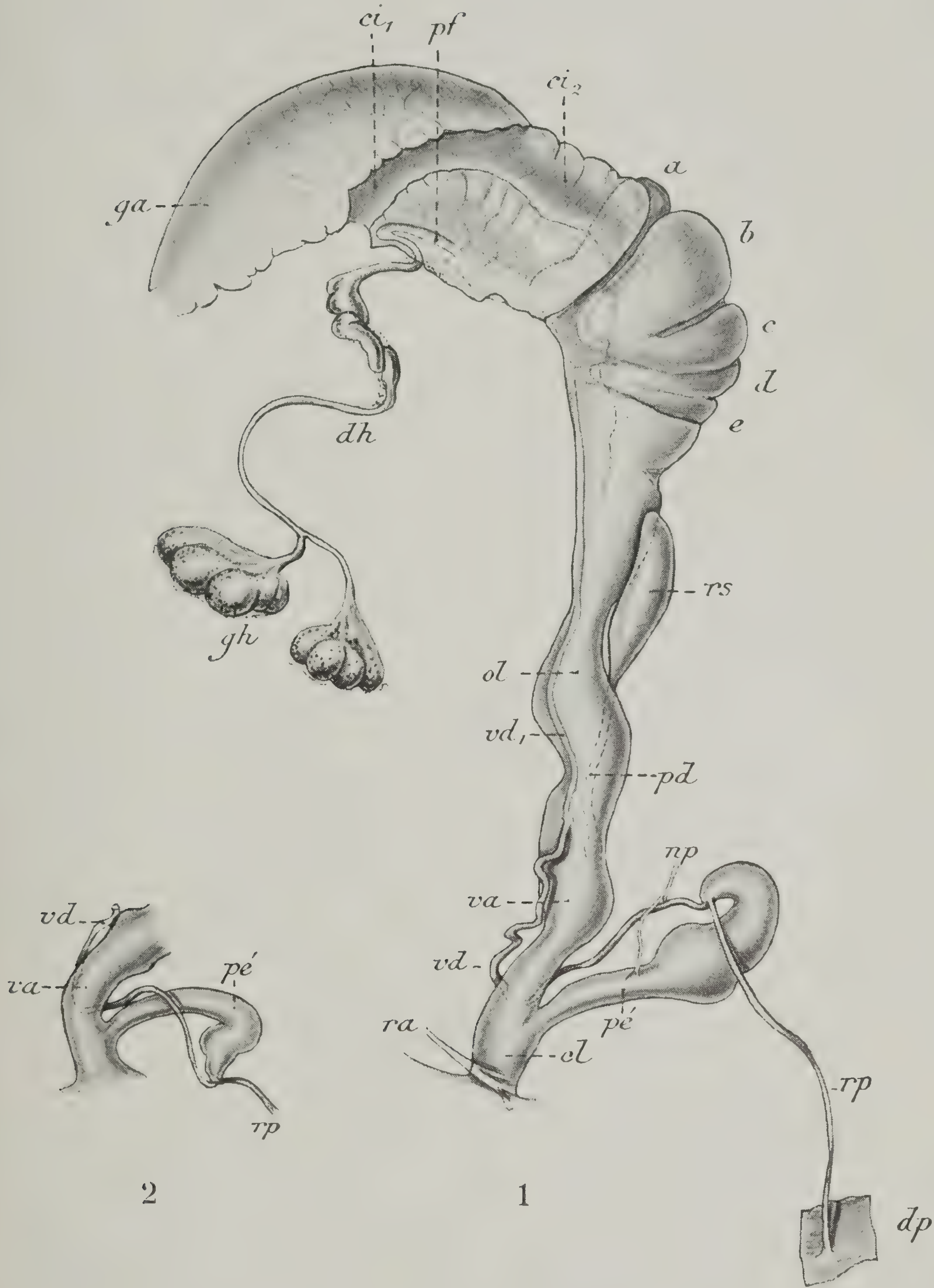
Planche XXIV.

Fig. 1. Organes génitaux de *Truncatellina costulata* Nilss., vus par-dessus.

Fig. 2. Pénis, moins développé, d'un autre individu fortement contracté.

Même échelle pour les deux figures.

a—e, replis de l'oviducte; ci_1, ci_2, sillon de la glande albuminipare, où est logé l'intestin; *cl*, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *pf*, poche de fécondation; *ra*, rétracteur allant à la base du cloaque génital; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent; vd_1, partie de ce canal, enchâssée dans la paroi de l'oviducte libre.



2

1

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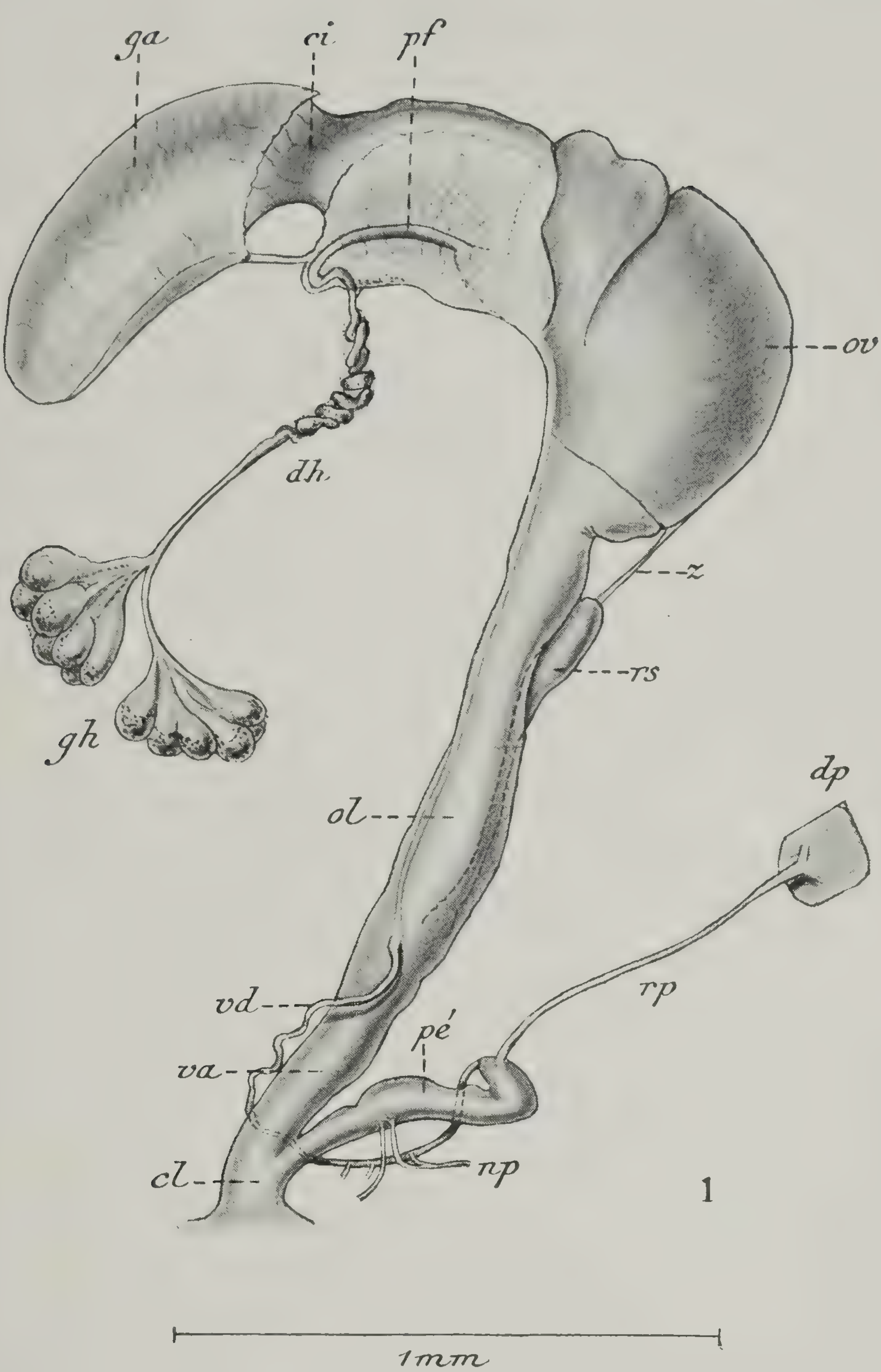
Planche XXV.

Fig. 1. Organes génitaux de *Truncatellina cylindrica* Fér., vus par-dessus. Exemplaire provenant de «Möen» (Danemark).

ci, emplacement de l'intestin dans la glande albuminipare; *cl*, cloaque génital; *dh*, canal hermaphrodite; *dp*, diaphragme; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *ol*, oviducte libre; *ov*, oviducte; *pé*, pénis; *pf*, poche de fécondation; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent; *z*, bande qui rattache la vésicule de la poche copulatrice à la région inférieure (distale) de l'oviducte.

Fig. 2. Mâchoire de *Columella edentula* Drap.

Fig. 3. Mâchoire de *Truncatellina cylindrica* Fér.



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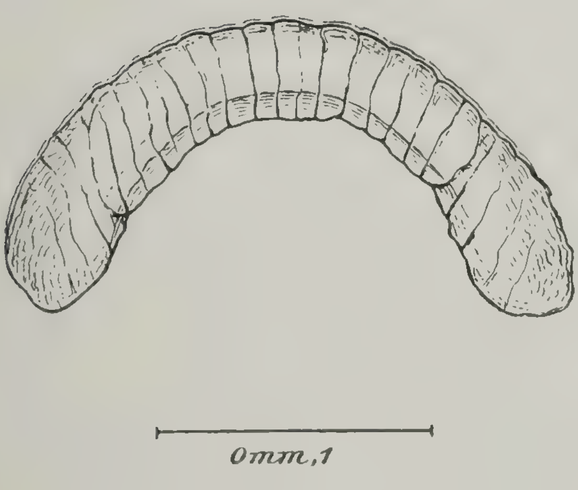

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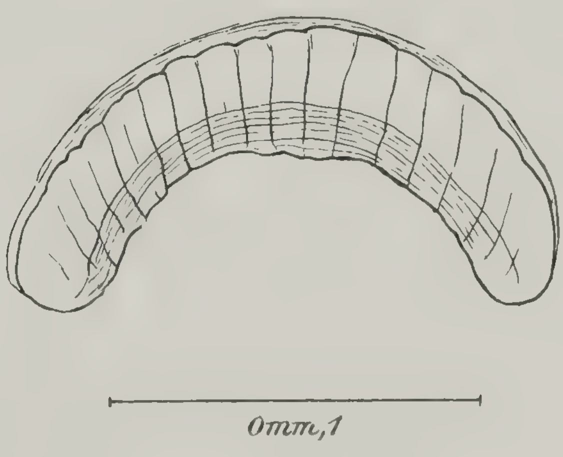

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Planche XXVI.

Fig. 1. Organes génitaux de *Truncatellina cylindrica* Fér., vus du dehors et par la face inférieure. L'individu, qui provient de Thuringe, manquait de pénis.

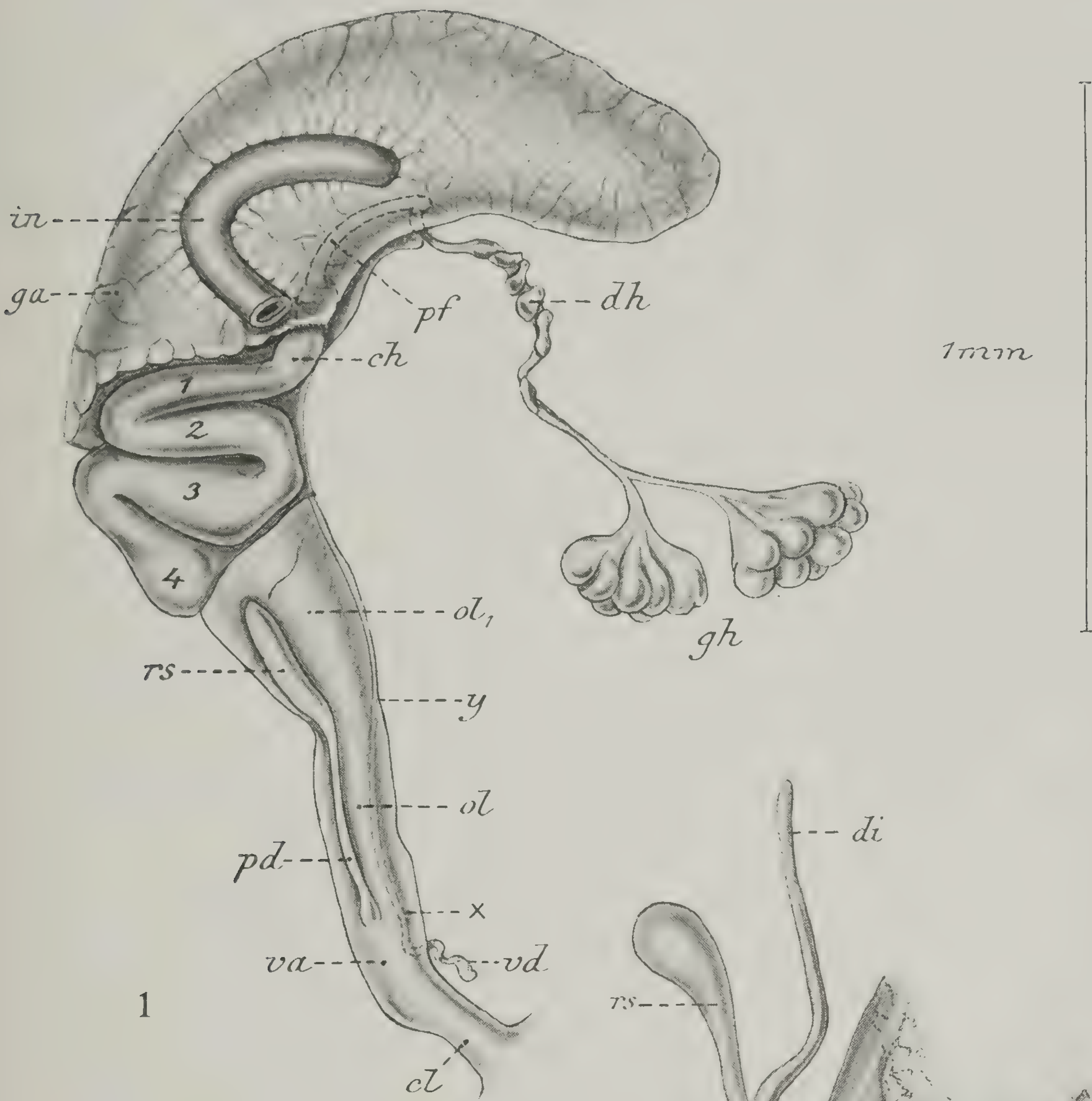
L'échelle correspondante se trouve à droite de la figure.

Fig. 2. Glande albuminipare et oviducte de *Vertigo pusilla* Müll., vus du côté extérieur et inférieur. Les organes n'ont pas été étendus, mais se trouvent dans leur position naturelle par rapport l'un à l'autre.

Fig. 3 et 4. Poche copulatrice de deux individus de *Pupilla cupa* Jan var. (?) *sterri* Voith.

Les indications suivantes s'appliquent aux trois figures:

ch, chambre de l'albumine; *cl*, cloaque génital; *dh*, canal hermaphrodite; *di*, diverticule de la poche copulatrice; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *in*, anse intestinale; *ol*, ol_1, oviducte libre; *ov*, oviducte; *pd*, pédoncule de la poche copulatrice; *pf*, poche de fécondation; *rs*, vésicule de la poche copulatrice; *ut*, utérus; *va*, vagin; *vd*, canal déférent; *x-y*, parcours du canal déférent dans l'oviducte libre; *1 –4*, replis de l'oviducte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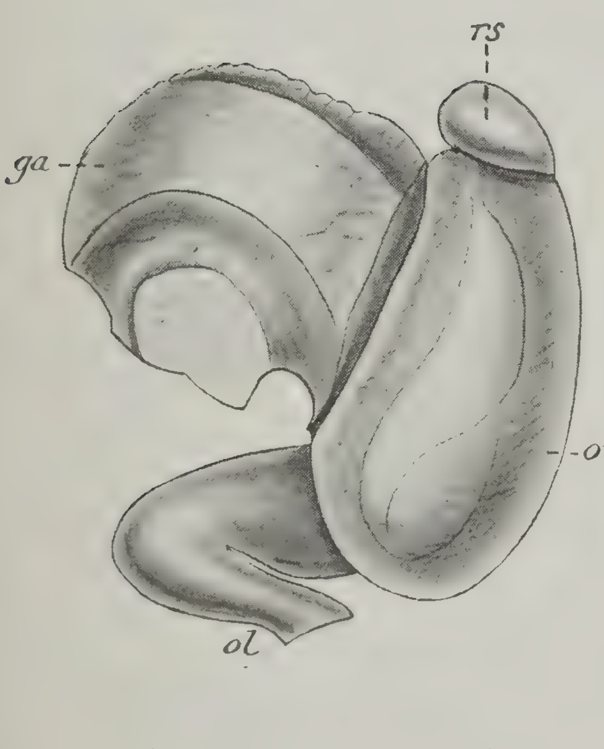
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3 4

Planche XXVII.

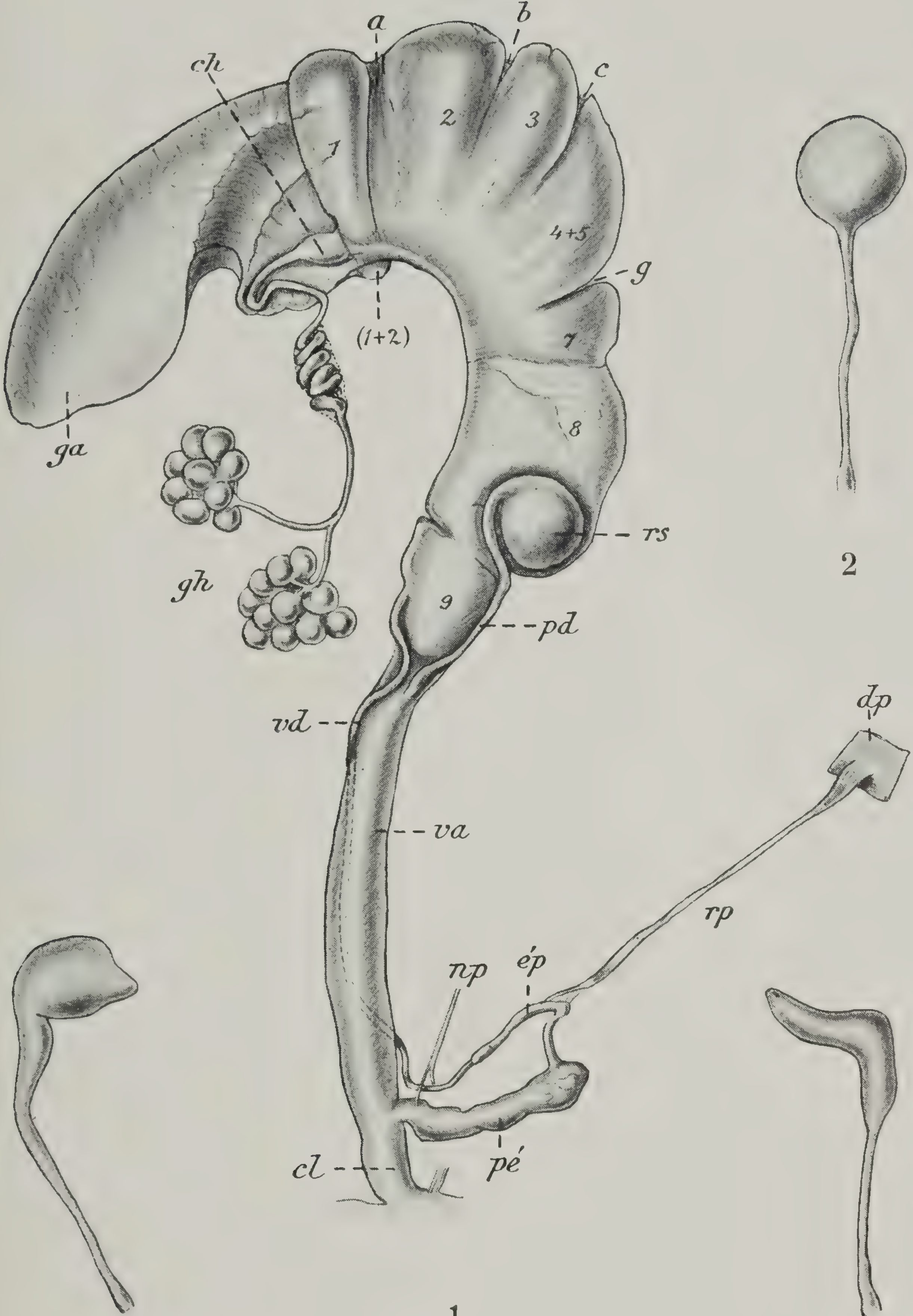
Fig. 1. Organes génitaux de *Columella edentula* Drap., vus pardessus. L'exemplaire provient de Suède (Skäralid).

1—9, différentes parties de la section femelle du spermoviducte et de l'oviducte libre (v. le texte, p. 99); *a—g*, replis entre les lacets de l'oviducte; *ch*, région inférieure, dilatée en forme de chambre, de la poche de fécondation; *cl*, cloaque génital; *dp*, diaphragme; *ép*, épiphallus; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *np*, nerf pénien; *pd*, pédoncule de la poche copulatrice; *pé*, pénis; *rp*, rétracteur pénien; *rs*, vésicule de la poche copulatrice; *va*, vagin; *vd*, canal déférent.

Fig. 2. La poche copulatrice du même individu (préparée séparément).

Fig. 3 et 4. Poche copulatrice de deux autres individus, recueillis en Danemark.

L'échelle est commune à toutes les figures.



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4

1mm

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Planche XXVIII.

Fig. 1. Poche de fécondation et prostate d'*Acanthinula harpa* Say.

Fig. 2. Poche de fécondation et région supérieure du spermoviducte d'un autre individu; la dernière a été fendue dans le sens longitudinal et déployée, pour montrer la chambre d'albumine.

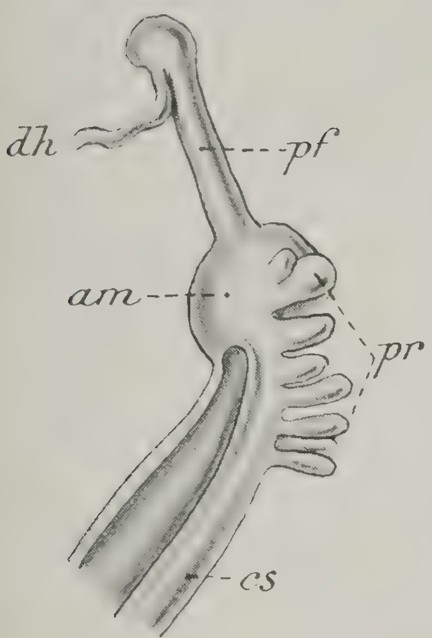
Lettres pour les fig. 1 et 2:

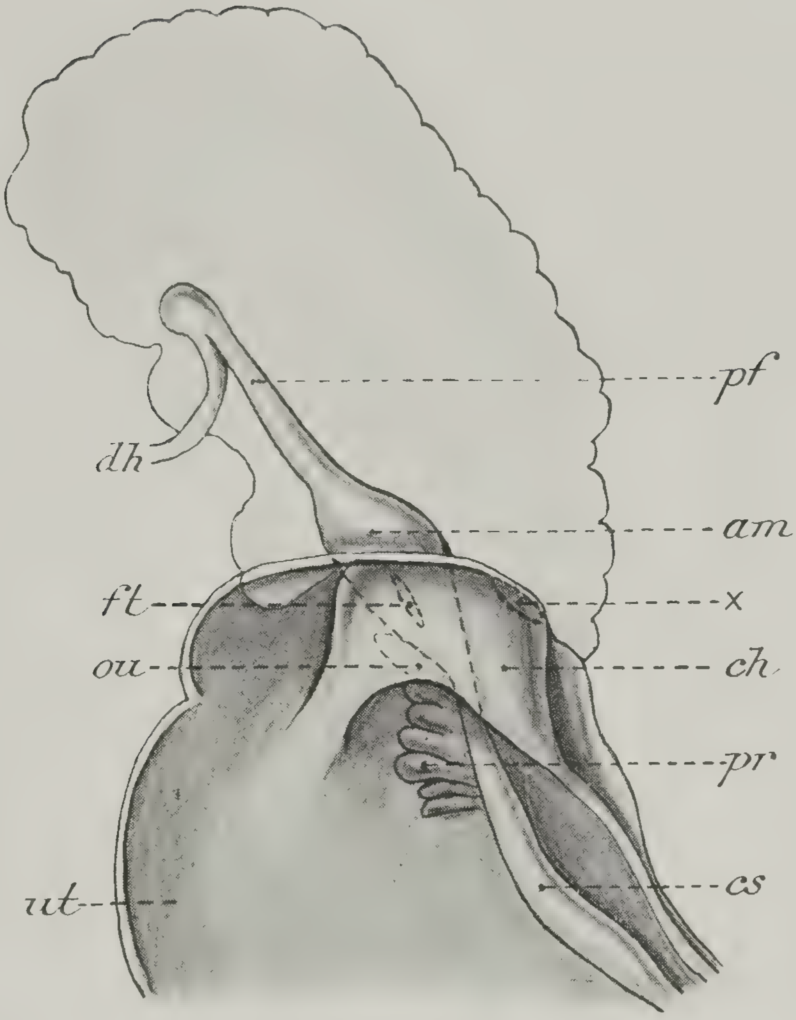
am, partie inférieure, dilatée, de la poche de fécondation; *ch*, chambre de l'albumine; *cs*, canal séminal; *dh*, canal hermaphrodite; *ft*, fente entre *am* et *ch*; *ou*, ouverture conduisant de la chambre de l'albumine dans l'utérus; *pf*, poche de fécondation; *pr*, prostate; *ut*, utérus; *x*, ouverture conduisant de la glande albuminipare dans la chambre de l'albumine.

Fig. 3. Organes génitaux de *Columella edentula* Drap., vus par la face inférieure et extérieure; ils proviennent de l'exemplaire qui, sur la pl. XXVII, fig. 1, a été dessiné vu par sa face supérieure; le grossissement est donc le même que dans cette figure.

1—7, lacets de la section femelle du spermoviducte; *8—9*, parties supérieures de l'oviducte libre; *a—g*, plis entre les lacets *1—7*; *ga*, glande albuminipare. Voir d'ailleurs le texte.

Fig. 4 et 5. *Acanthinula harpa* Say. Poche copulatrice de deux individus différents. *di*, diverticule de la poche copulatrice.





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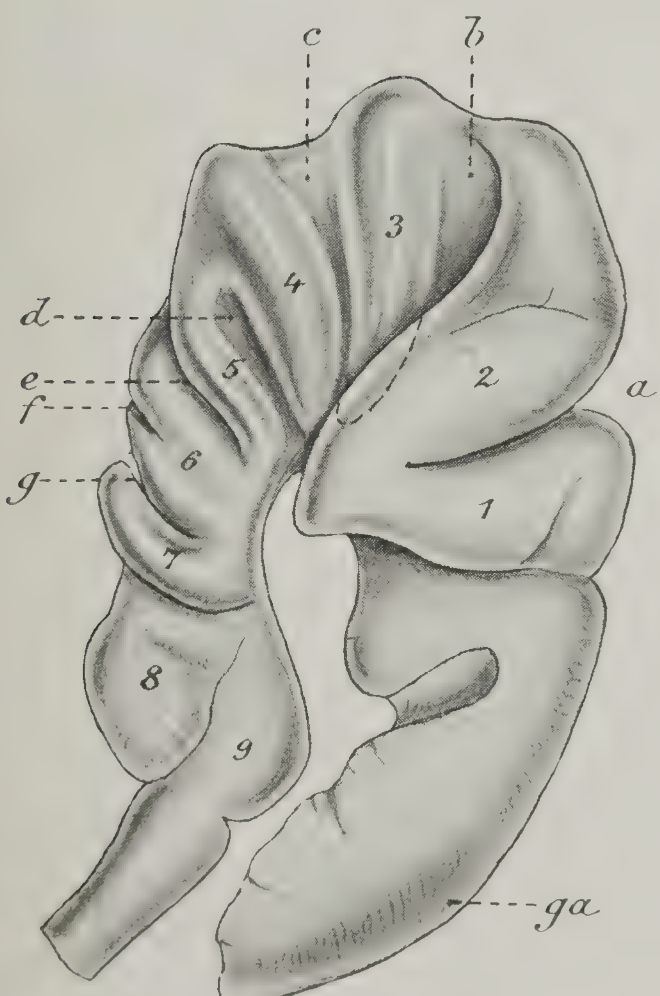

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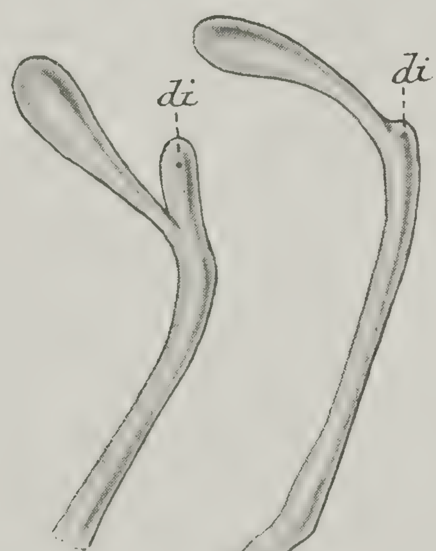

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1 mm

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Planche XXIX.

Organes génitaux d'*Acanthinula harpa* Say, vus par la face supérieure.

am, partie inférieure, dilatée, de la poche de fécondation; *cs*, canal séminal; *dh*, canal hermaphrodite; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *og*, orifice génital; *ol*, oviducte libre; *om*, ommatophore; *pd*, pédoncule de la poche copulatrice; *pf*, poche de fécondation; *pr*, prostate; *rs*, vésicule de la poche copulatrice; *ut*, utérus; *va*, vagin; *vd*, canal déférent.

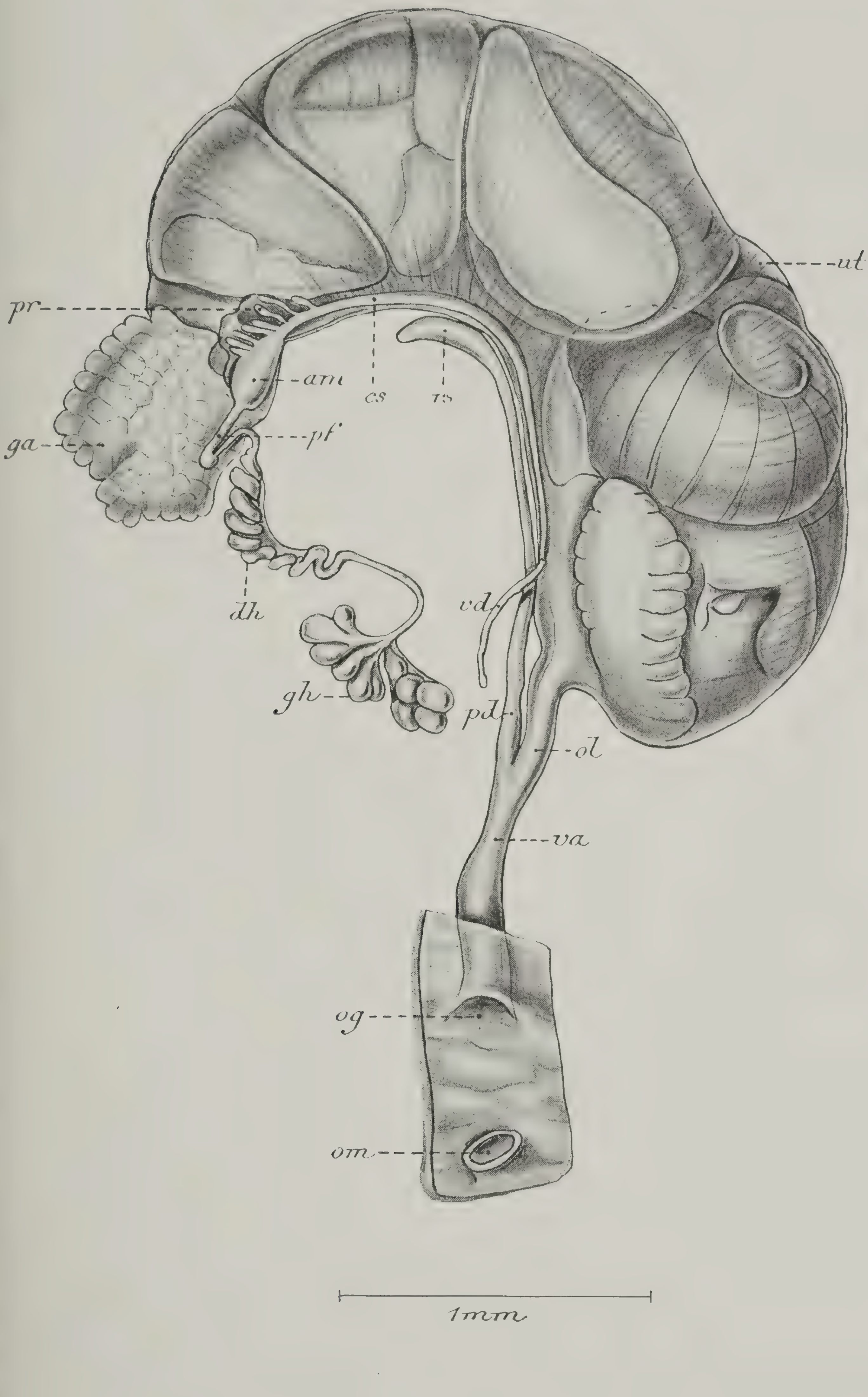
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Planche XXX.

Fig. 1. Foie inférieur de *Chondrina similis* Brug.

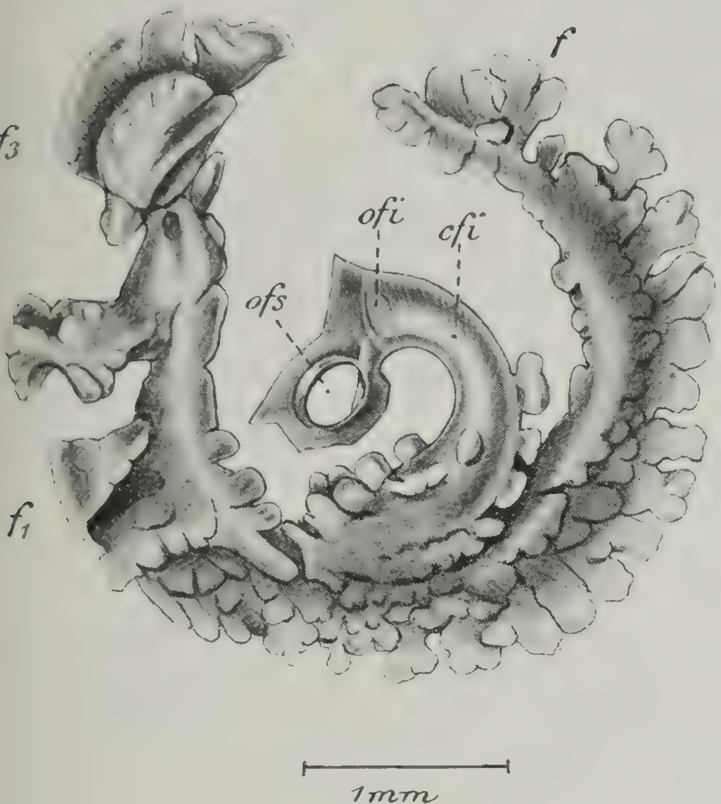
cfi, conduit excréteur; *f*, f_1, f_2, f_3, les 4 lobes du foie; *ofi*, orifice par lequel le conduit excréteur du foie inférieur débouche dans l'estomac; *ofs*, le même pour le foie supérieur.

Fig. 2. Mâchoire de *Vertigo antivertigo* Drap.

Fig. 3. Tube digestif (in situ) de *Vertigo moulinsiana* Dup.

Fig. 4. Tube digestif (in situ) d'*Abida secale* Drap.

Les lettres suivantes conviennent aux fig. 3 et 4: an_1, 1re anse intestinale; an_2, 2e anse intestinale, située à la surface; *es*, estomac; *fs*, foie supérieur; *mo*, organe pulsateur de Mermod; *oe*, œsophage; *op*, pneumostome; *I—III*, diverses sections de l'intestin (voir le texte).



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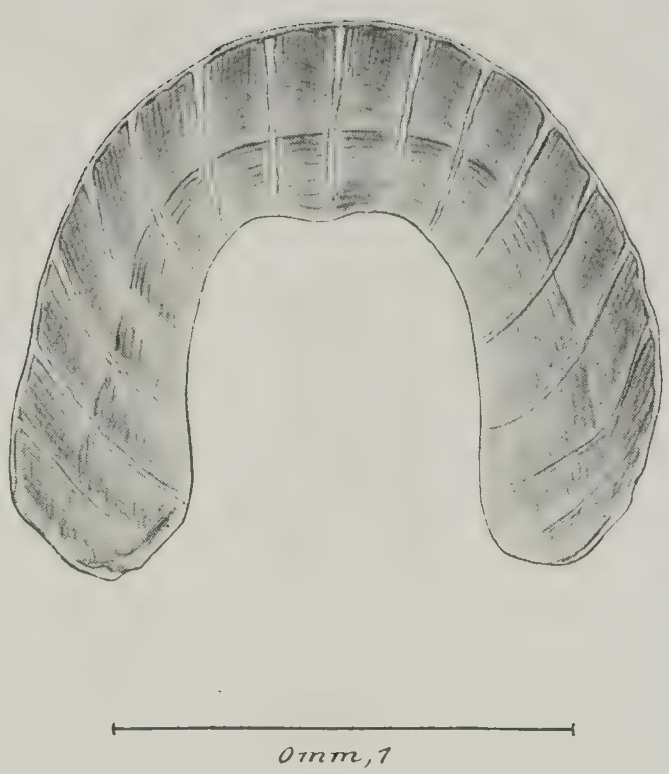

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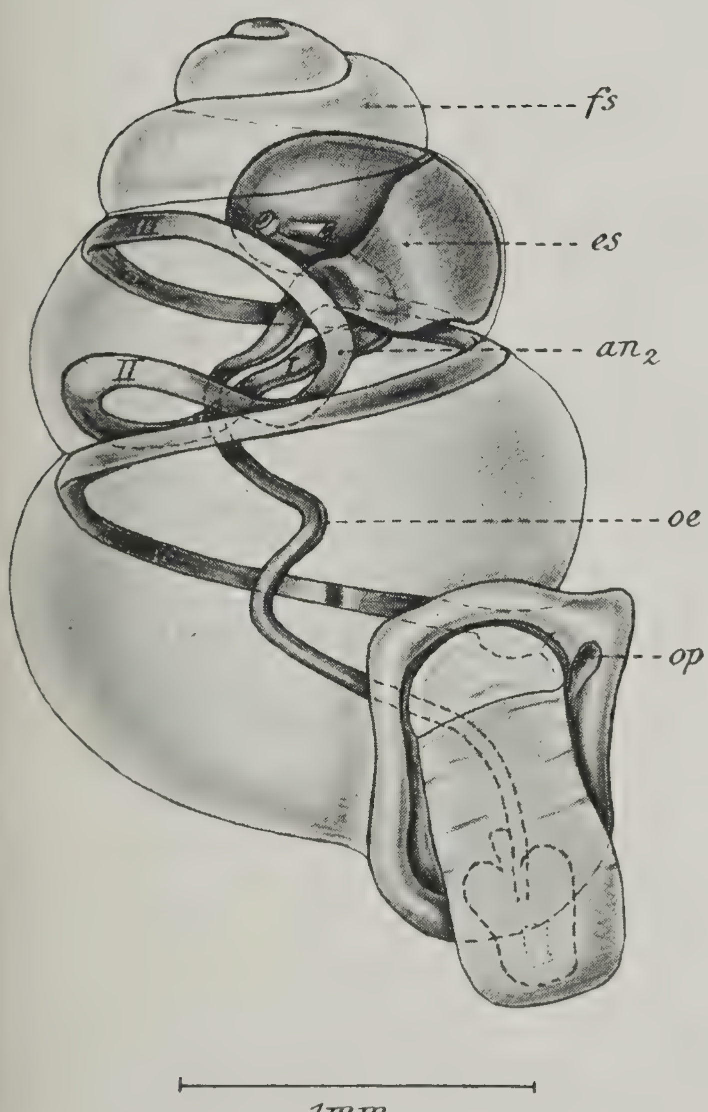

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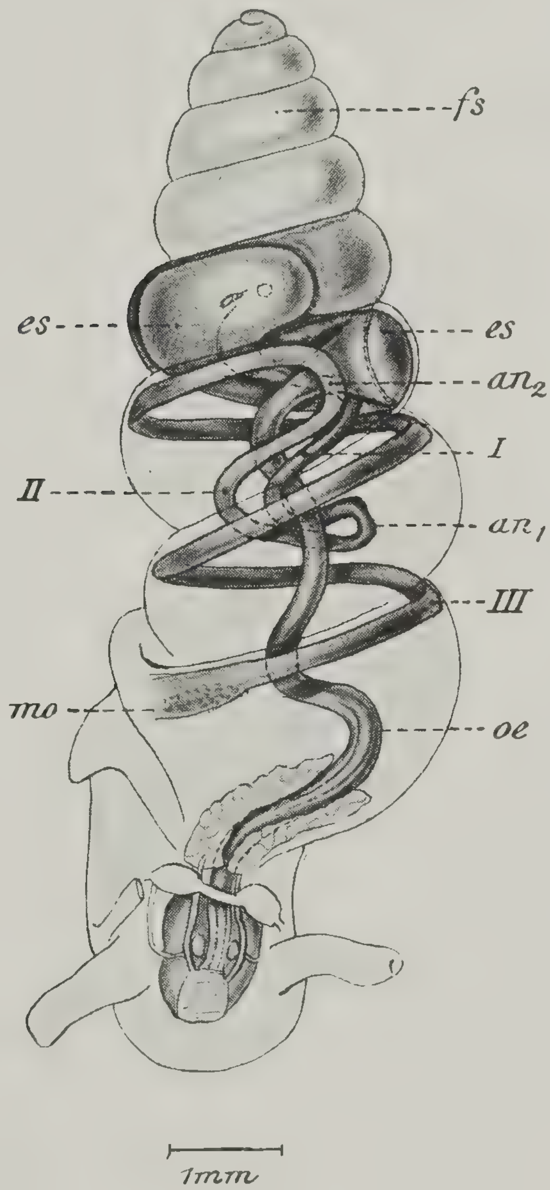

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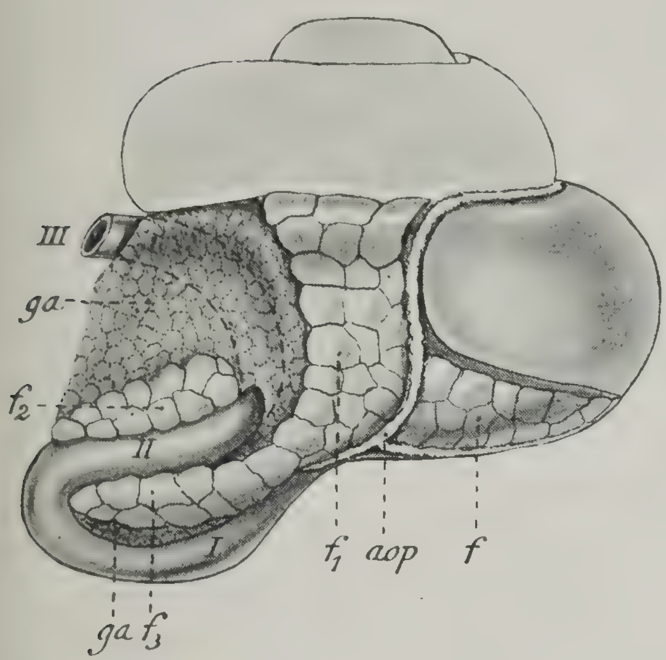
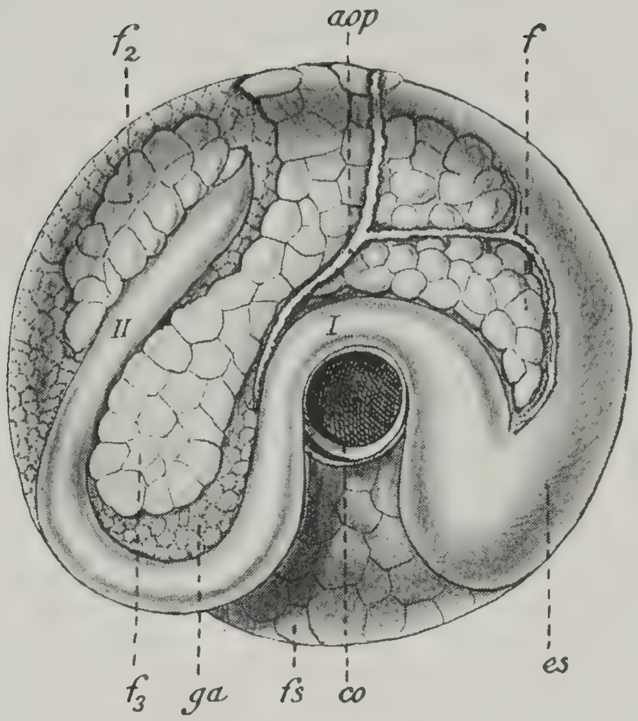
Planche XXXI.

Fig. 1—3. Organes digestifs de *Vertigo moulinsiana* Dup.

Les figures 1 et 2 montrent la position du foie et du canal intestinal dans les tours du sac viscéral. Dans la fig. 1, ceux-ci sont vus de côté, dans la fig. 2, par-dessous. Dans la fig. 3, l'estomac, l'intestin et les deux foies sont préparés séparément.

aop, aorte postérieure; *cfi*, conduit excréteur du foie inférieur; *cfs*, conduit excréteur du foie supérieur; *co*, columelle; *dh*, canal hermaphrodite; *es*, estomac; f, f_1, f_2, f_3, les 4 lobes du foie inférieur; *fs*, foie supérieur; *ga*, glande albuminipare; *gh*, glande hermaphrodite; *oe*, œsophage; *I—III*, anses intestinales.


III
ga
f_2
II
I
f_1
aop
f
ga
f_3


f_2
aop
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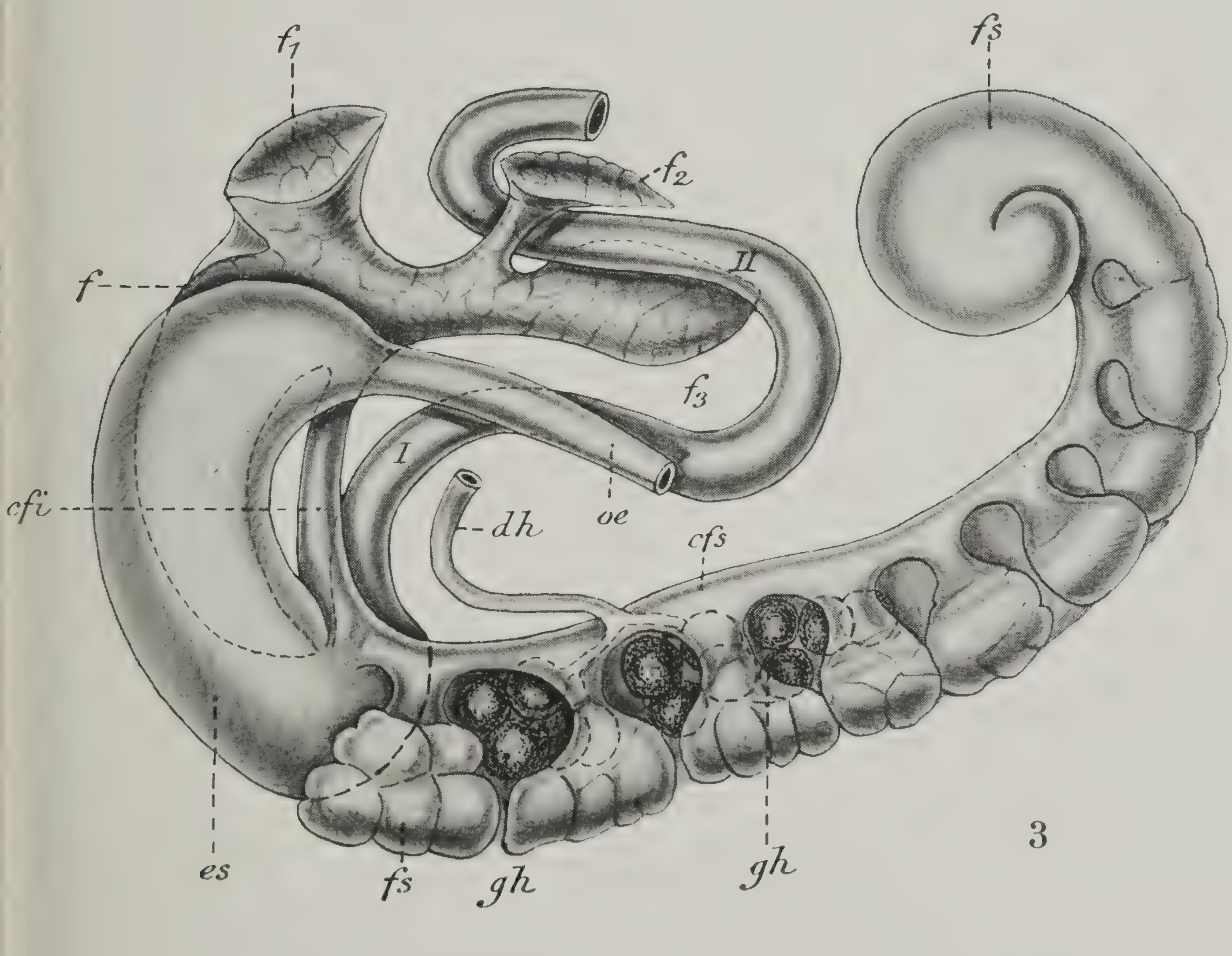
f_1
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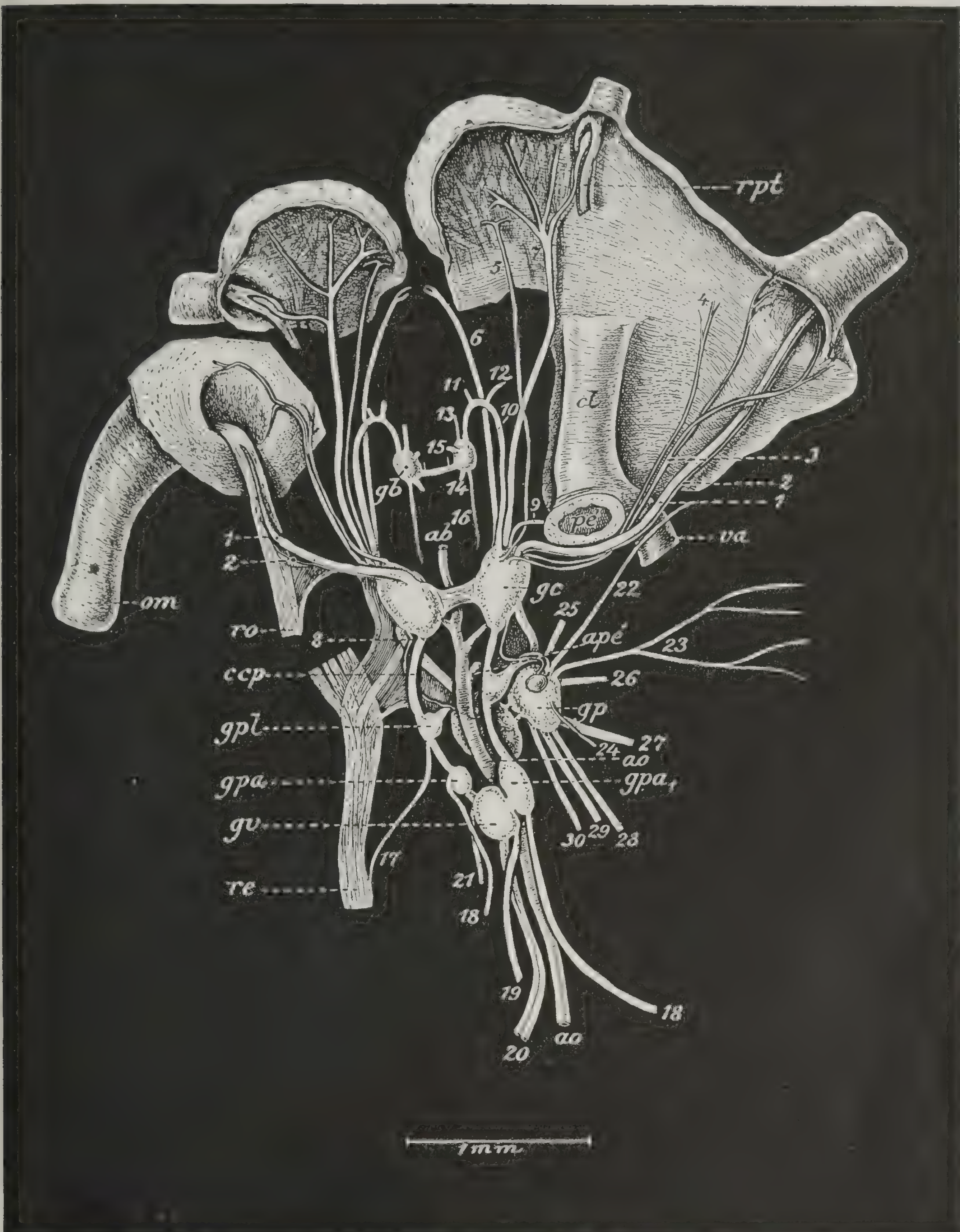

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Pl. XXXII. Système nerveux de *Chondrina similis* Brug. Nerfs et ganglions se trouvent dans leur position naturelle par rapport les uns aux autres. — *ab*, artère buccale; *ao*, aorte; *apé*, artère pédieuse; *ccp*, connectif cérébro-pleural; *cl*, cloaque génital; *gb*, ganglion buccal; *gc*, ganglion cérébroïde; *gp*, ganglion pédieux; *gpa*, *gpa1*, ganglions pariétaux gauche et droit; *gpl*, ganglion pleural gauche; *gv*, ganglion viscéral; *om*, ommatophore; *pé*, pénis; *re*, rétracteur externe; *ro*, rétracteur de l'ommatophore; *rpt*, rétracteur du petit tentacule; *va*, vagin. — *1*, nerf olfactif; *2*, nerf optique; *3*, nerf péritentaculaire externe; *4*, nerf cutanéo-céphalique; *5*, nerf labial interne; *6*, nerf labial externe; *7*, nerf labial médian; *8*, nerf acoustique; *9*, nerf pénien; *10*, connectif cérébro-buccal; *11-12*, second nerf pharyngien; *13*, premier nerf pharyngien; *14*, troisième nerf pharyngien; *15*, nerf gastrique antérieur; *16*, nerf gastrique postérieur(?); *17*, nerf du rétracteur externe; *18*, nerf palléal; *19*, nerf intestinal; *20*, nerf anal; *21*, nerf cutanéo-palléal; *22-24*, nerfs pédieux dorsaux; *25-30*, nerfs pédieux ventraux.

Planche XXXIII.

Système rétracteur de *Chondrina similis* Brug. Les deux rétracteurs externes sont vus du côté intérieur, la partie postérieure du pied, du côté droit et un peu par devant, et le pharynx tout à fait par derrière.

ép, région épiphallienne du pénis; *l*, lèvre; *m*, collier palléal; *nl*, nerf labial médian; *om*, ommatophore; *pé*, pénis (partie distale); *ph*, pharynx; *pi*, pied (partie postérieure); *pt*, petit tentacule; *rd*, rétracteur du côté droit; *re*, rétracteur externe (du côté gauche les lettres *re* ont été placées, par mégarde, un peu en avant sur le rétracteur pharyngien); re_1, re_2, re_3, ses ramifications dans le côté droit; *ri*, rétracteur interne; ri_1, ri_2, ramifications antérieures et postérieures de celui-ci, s'épanouissant dans le pied; *ro*, rétracteur de l'ommatophore; *rp*, rétracteur pénien; *rpd*, rétracteur pédieux; *rph*, rétracteur pharyngien; *rpt*, rétracteur du petit tentacule; *rs*, rétracteur du côté gauche.

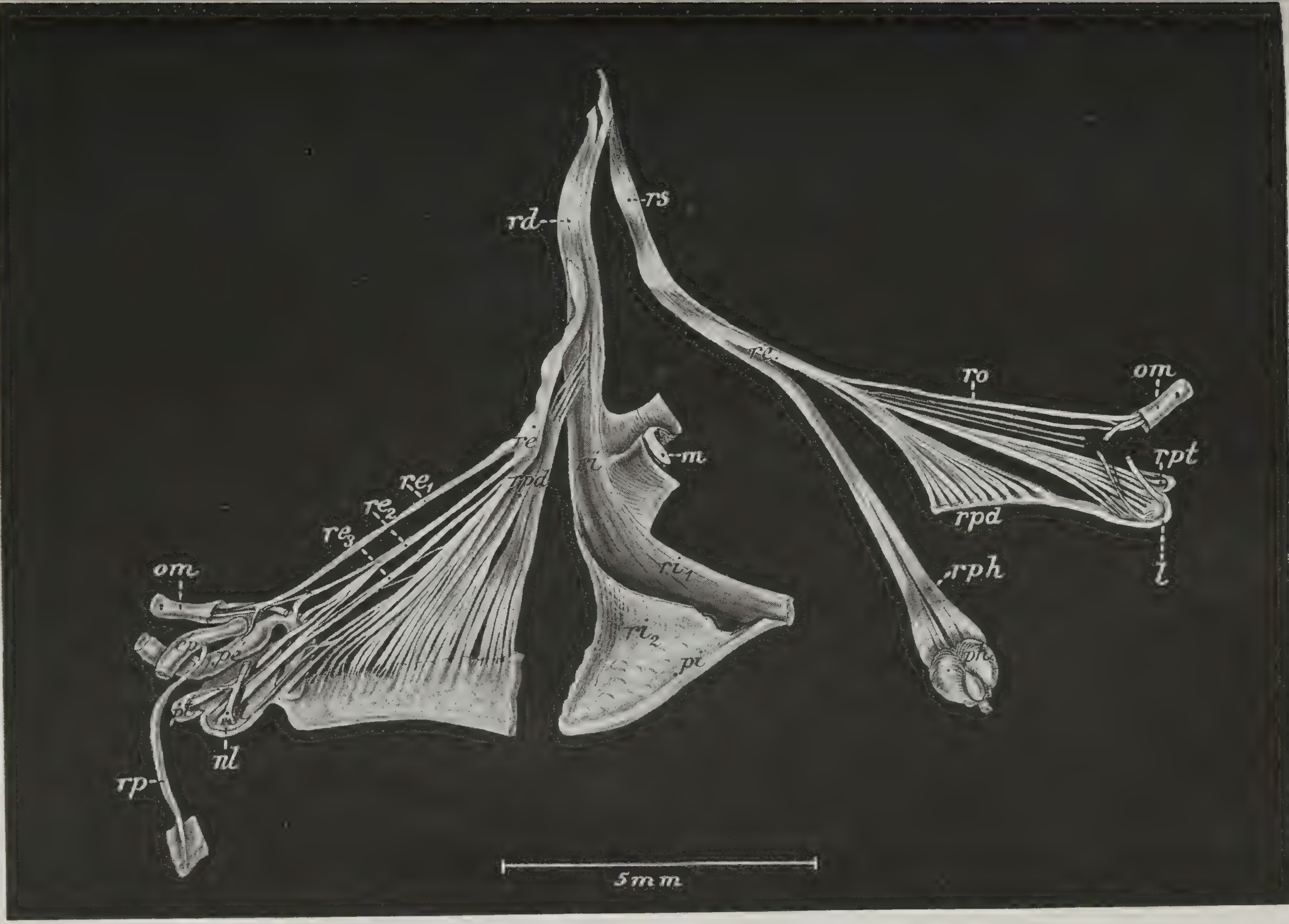

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Planche XXXIV.

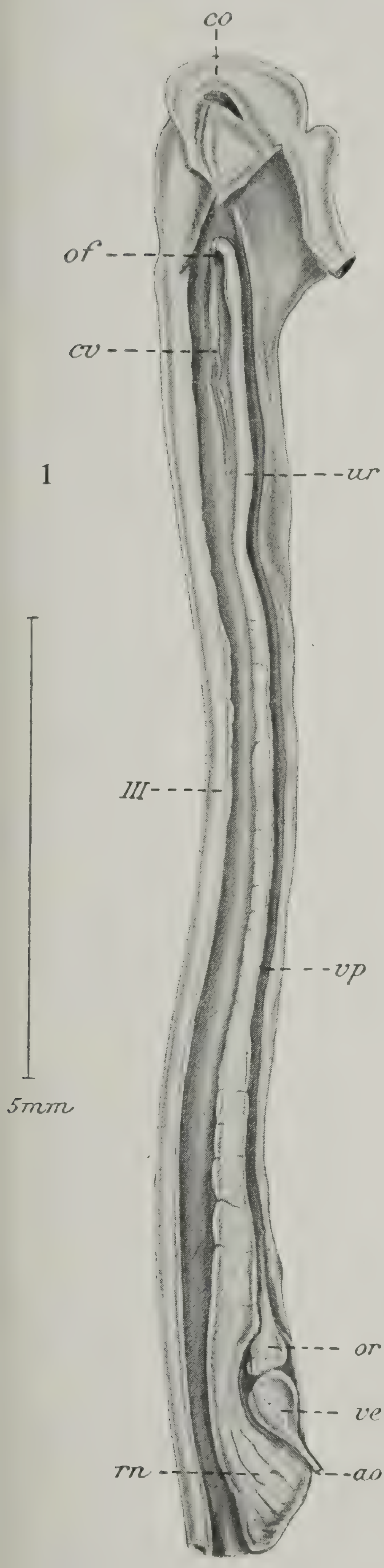
Fig. 1. Plafond de la cavité pulmonaire avec ses organes chez *Orcula dolium* Drap.

Fig. 2. Mêmes organes chez *Vertigo moulinsiana* Dup.

Les indications suivantes s'appliquent à ces deux figures:

ao, aorte; *co*, collier palléal; *cv*, faible pli et rainure qui de l'orifice rénal conduisent en arrière (v. le texte); *of*, orifice rénal (orifice de l'uretère); *or*, oreillette; *pc*, péricarde; *rn*, rn_1, sac rénal; *ur*, uretère; *ve*, ventricule; *vp*, vp_1, veine pulmonaire; *III*, rectum.

Fig. 3. Structure interne de la partie proximale (épiphallienne) du pénis chez *Abida secale* Drap.



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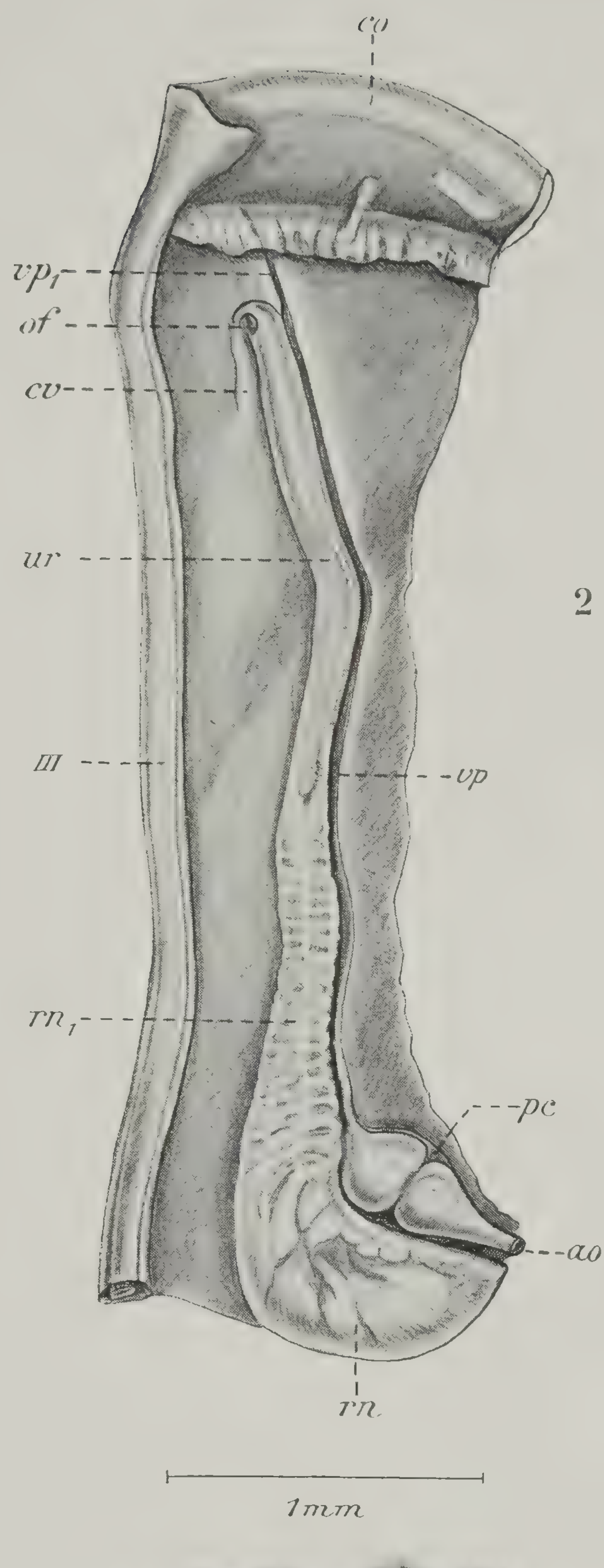

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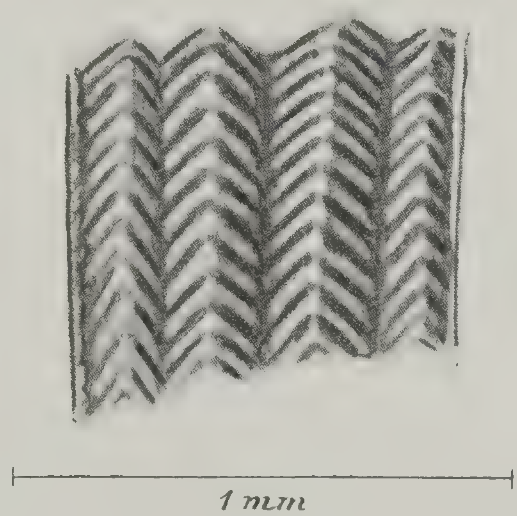

3

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Les Méduses de la Norvège

par

P. L. Kramp (Copenhague) et **D. Damas** (Liége).

Introduction et Partie spéciale I.

(Planche XXXV).

Préface.

En août 1900, le Dr Hjort inaugura à bord du vapeur le "Michael Sars" une série de recherches scientifiques et pratiques des pêcheries. Le travail mené avec une énergie peu commune a donné des résultats excessivement importants.

Ces recherches avaient avant tout un but national et pratique. A aucun moment ce double caractère n'a été perdu de vue; et. bien que d'importants matériaux intéressant la zoologie pure aient été récoltés, leur conservation et leur utilisation ont été subordonnées à l'objet principal de ces croisières, l'étude des poissons comestibles et des questions économiques qui s'y rattachent. Dès le début, un groupe d'animaux invertébrés a cependant fait l'objet d'une attention spéciale: celui des méduses.

Lors de la première croisière du "Michael Sars", le Dr Hjort a fait la découverte extrêmement importante, que les jeunes morues nées au voisinage du littoral ou sur les bancs côtiers sont entraînées, durant les premiers mois de leur existence, au dessus des profondeurs considérables du bassin norvégien de l'Océan atlantique et portées à une distance considérable du continent et de leur lieu d'origine. On trouve au mois d'août à mi-distance entre la Norvège et Jan Mayen des jeunes morues mesurant de 6 à 10 cms qui sont incontestablement nées sur les bancs côtiers. Cette migration est l'un des faits les plus importants de la biologie de la morue. Cette migration est passive.

Les jeunes poissons accompagnent de nombreuses méduses du genre *Cyanea* brune sous lesquelles ils cherchent abri et protection. Ces méduses sont nées, elles aussi, au printemps le long du littoral et, entraînées par les courants, sont transportées à des distances formidables de leur lieu d'origine. Entre ces Gadides et les méduses existent donc des rapports biologiques étroits. Certaines d'entre elles peuvent être considérées comme le meilleur indicateur des eaux côtières, et les journaux de bord notent fréquemment la présence des méduses les plus caractéristiques, comme aussi les rapports des naturalistes norvégiens font fréquemment allusion à leur distribution.

En 1903, ayant eu l'avantage de suivre les cours d'océanographie instaurés par le Bureau des Pêcheries et le Musée de Bergen, je me rendis dans le village de Solsvik et j'eus l'occasion d'assister à ce phénomène remarquable, déjà entrevu par le "Michael Sars", de l'immigration dans les eaux côtières de la Norvège d'innombrables organismes provenant de l'Atlantique proprement dit, Méduses, Siphonophores, Arachnactis, Salpes, Leptocéphales. Ce transport, l'un des plus remarquables exemples des migrations passives exécutées par les animaux pélagiques, excita vivement mon intérêt. Aussi je saisis avec empressement l'occasion qui me fut offerte par le Dr Hjort de participer aux croisières du "Michael Sars" et de m'initier plus spécialement à l'étude du plankton et des lois de sa distribution.

Pendant les années 1904 à 1909, je ne perdis jamais de vue la question des méduses malgré de nombreuses autres occupations zoologiques, et au cours des croisières du vapeur norvégien d'exploration, comme pendant de fréquents séjours à la station biologique de Bergen, je recueillis de nombreux matériaux pour l'étude systématique et géographique de ces animaux. Le Dr Hjort me permit d'utiliser pour ce travail les collections faites par le "Michael Sars" dans le bassin norvégien de l'Atlantique comme aussi les notes rassemblées dans le journal du bord. Ce sont les résultats principaux de ces études que nous publions aujourd'hui. Des circonstances indépendantes de notre volonté et les obligations d'un professorat particulièrement chargé ont retardé cette publication.

Nous avons pu la mener à bonne fin grace à la collaboration de M. Kramp qui dans ces dernières années a eu l'occasion de faire

la révision des méduses de l'Atlantique sur un matériel exceptionnellement abondant. En nous associant avec M. Kramp nous avons pensé donner une valeur plus grande à notre travail. Le matériel norvégien complète d'une manière heureuse les investigations des naturalistes danois. Ceux-ci ont étudié d'une manière approfondie les eaux littorales si intéressantes de leur pays. De plus, grâce aux expéditions conduites par le Dr J. Schmidt un matériel réellement exceptionnel a été rassemblé dans la Mer du Nord, les parages des îles Féroé, le pourtour de l'Islande, le canal de la Manche, la bordure atlantique du continent européen, la Méditerranée.

Il est important qu'un semblable travail puisse à toute époque être contrôlé par l'examen de spécimens originaux. Aussi, nous nous sommes fait un devoir de déposer tout le matériel existant des méduses examinées dans l'endroit qui nous paraît le mieux désigné pour sa conservation définitive, et nous l'avons confié au Musée de Bergen où les personnes intéressées pourront le consulter.

Toute étude biologique repose, en premier lieu, sur une détermination spécifique exacte. Dans le cas des méduses, il est indispensable de connaître les divers stades de développement que parcourt l'animal après sa libération du polype progéniteur. Aussi nous avons consacré une partie importante de la première partie de ce travail, à la discussion systématique. Nous nous sommes cependant abstenu, en général, de reproduire la bibliographie et la synonymie de chaque espèce. On la trouvera dans les travaux de M. Kramp.

Il eut été évidemment très désirable que cette détermination eût pu être faite immédiatement à bord sur le matériel frais. L'état de nos connaissances relatives aux méduses au moment où ce travail a été entrepris a empêché la réalisation de ce programme. Aussi nous nous sommes fait une règle absolue de ne publier que les documents positifs relatifs à chaque espèce, c'est-à-dire les renseignements d'ordre systématique et géographique qui résultent de l'examen des collections. L'étude de chaque espèce est accompagnée d'une liste indiquant le matériel soumis à notre révision. Dans certains cas cependant, nous y avons ajouté les notes tirées du journal de bord. Il s'agit alors de formes très caractéristiques, pour lesquelles le doute n'était pas permis. Par contre nous nous sommes abstenus de publier les notes plus nombreuses pour lesquelles

une suspicion, si légère soit-elle, pouvait s'élever. D'innombrables méduses ont, en effet, été capturées qui n'ont pas été conservées ou dont aucune trace n'est restée dans le journal. A ceux qui seraient tentés de blâmer cette négligence, nous rappellerons que les circonstances dans lesquelles se fait le travail océanographique et surtout le but primordial assigné à chacune des croisières du "Michael Sars", constituent une ample justification. On ne doit pas perdre de vue que l'étude des pêcheries faisait à bord du "Michael Sars" l'objet des préoccupations principales de tout l'équipage et qu'à aucun moment, il n'a été perdu de vue. Dans une entreprise d'un caractère national et économique, il ne pourrait paraître licite de subordonner le succès des recherches relatives à la biologie des poissons et aux bases rationnelles de l'industrie de la pêche, à des questions d'ordre scientifique et spéculatif si intéressantes qu'elles soient. Aussi les études sur les méduses ont eu nécessairement un caractère occasionnel et secondaire sur lequel il nous paraît important d'insister. Nous ne voulons pas créer l'impression que dix années d'exploration intensive ont dans ce domaine conduit à l'étude complète de la faune norvégienne. Il nous paraît indispensable d'indiquer les limites dans lesquelles elles ont été effectuées ainsi que les principales lacunes au point de vue géographique comme au point de vue saisonnier, dont elles sont affligées. C'est ce que nous ferons dans la seconde partie consacrée à la discussion des problèmes généraux relatifs à la biologie des méduses.

D. Damas.

Remarques supplémentaires a la Préface.

Ce qui est publié par nous dans le présent volume c'est la partie de notre œuvre due à une collaboration directe des deux auteurs, c'est à dire le traitement morphologique, systématique et zoogéographique de chaque espèce particulière des Hydroméduses. Un grand matériel de ces animaux avait été conservé, et pendant mon séjour à Liége en 1920 j'en ai fait la révision. Nul matériel des Scyphoméduses n'ayant été conservé il fallait par conséquent baser le traitement de ce groupe exclusivement sur les notes des journaux du "Michael Sars". Ce dernier traitement sera publié plus

tard ainsi que la partie générale dans laquelle seront conglomérées les dates biologiques et zoogéographiques, traitées particulièrement à chaque espèce dans la partie spéciale. P. L. Kramp.

Liste alphabétique des Localités.

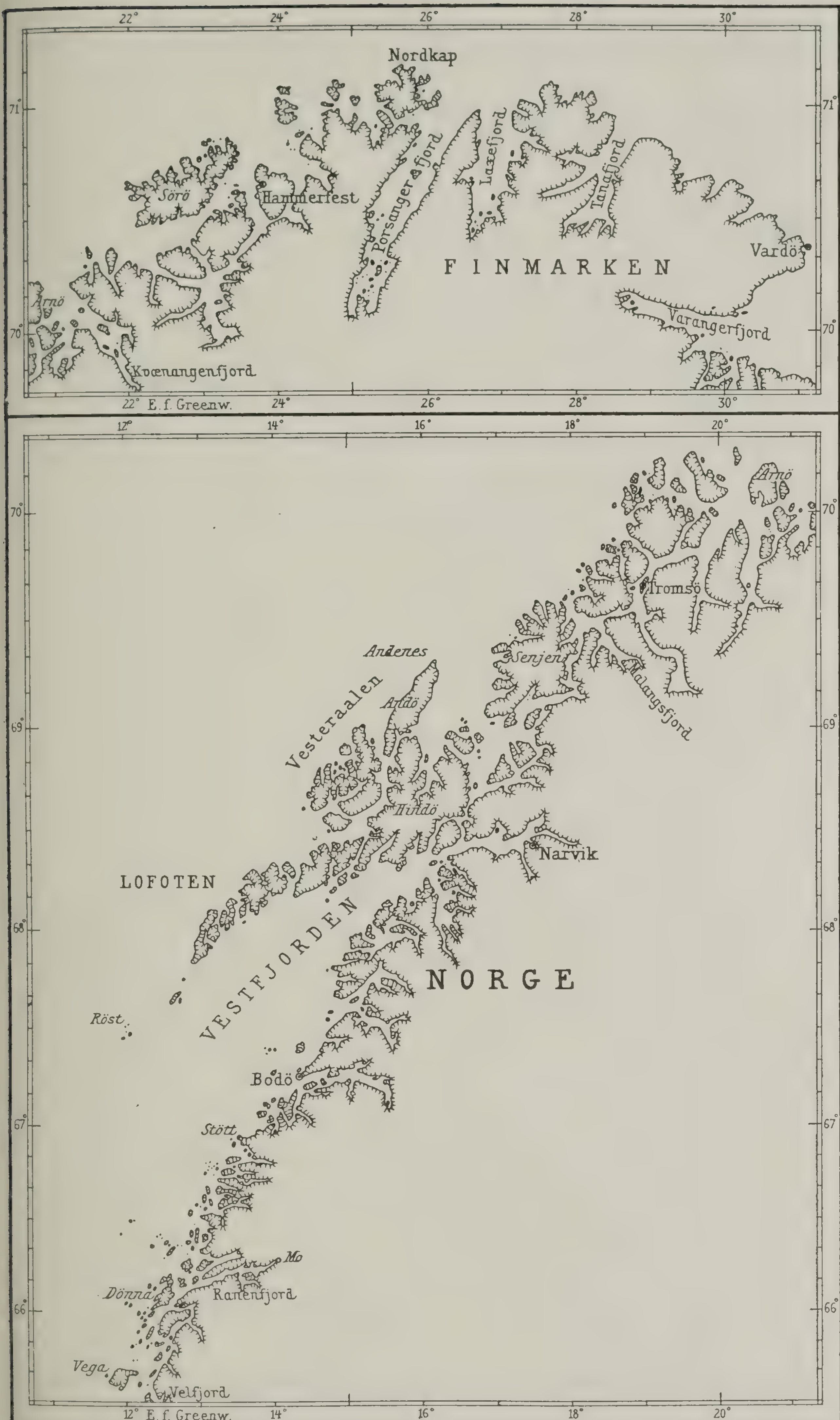
Seulement les noms espacés se trouvent sur les cartes annexées; aux noms des autres localités des endroits avoisinants sont ajoutés entre parenthèses; quant à la situation exacte de ces localités il faut avoir recours à des cartes de plus grandes dimensions.

Aalesund.
Aasefjord (Borgundfjord, près d'Aalesund).
Aglapsbaaen (au sud de Malangsfjord).
Andsnaes (embouchure de Malangsfjord).
Arendal.
Aspevaagen (Aalesund).
Bastelid (Stavanger).
Bergen.
Björlakgrund (Aalesund).
Björnebaaen (Aalesund).
Björnefjord (au sud de Bergen).
Björnsund (à hauteur de Moldefjord).
Bodö (au nord-ouest de Bergen).
Borgundfjord (Aalesund).
Byfjord (Bergen).
Christianiafjord.
Christiansand.
Christiansund.
Dröbak (Christianiafjord).
Drönen (Haröfjord, Aalesund).
Edö (au nord de Christiansund).
Espholm (Stavanger).
Feje (au nord-ouest de Bergen).
Finö (Aalesund).
Fjaertoft (Haröfjord, Aalesund).
Fladskaer (Bodö, au nord-ouest de Bergen).
Florö.
Förde (Stavanger).

F o l d e n f j o r d.
Galdreskaer (à hauteur de Moldefjord).
Gibostad (au sud de Malangsfjord).
Gimsöströmmen (Lofoten).
Giskö (Aalesund).
Godö (Aalesund).
Godösund (Björnefjord, à hauteur de Hardangerfjord).
Hadselfjord (Lofoten).
H a m m e r f e s t.
Haramsö (Haröfjord, Aalesund).
H a r d a n g e r f j o r d.
Hareid (près de Sulefjord, au sud d'Aalesund).
Haröfjord (au nord d'Aalesund).
Haugsholmen (au sud d'Aalesund).
Havnevaag (Malangsfjord).
Hekkingen (à hauteur de Malangsfjord).
Henningsvaer (Lofoten).
H e r l ö f j o r d (au nord-ouest de Bergen).
Herö (Aalesund).
Hessefjord (Aalesund).
Hjeltefjord (Bergen).
H j ö r u n d f j o r d (Aalesund).
Hodne (au sud de Hardangerfjord).
Huglen (au sud de Björnefjord).
Jossefjord (Stavanger).
Kalvaag (au sud de Stat).
Karlsbaaen (Aalesund).
Klosternaes (au sud de Björnefjord).
Kravik (Malangsfjord).
Kroksholm (Aalesund).
K v æ n a n g e n.
Landegode (à l'entrée de Vestfjord).
Lepsö (à hauteur de Haröfjord, Aalesund).
L i n d e s n a e s.
L o f o t e n.
Lyngdalsfjord (entre Lister et Lindesnaes).
Lysefjord (Stavanger).
Malangsbanken (au nord-ouest de Tromsö).

Malangsfjord (au sud de Tromsö).
Mastrafjord (Stavanger).
Mofjord (Bergen).
Molde.
Moldefjord (Molde).
Moskenaesström (Lofoten).
Nokkelbaaen (Bodö, au nord-ouest de Bergen).
Nordaasvand (au sud de Bergen).
Ofotenfjord (près de Narvik).
Ona (entre Aalesund et Christiansund).
Os (Björnefjord).
Osterfjord (Bergen).
Porsangerfjord.
Puddefjord (Bergen).
Risör.
Romsdalsbanken (à hauteur de Romsdalsfjord).
Romsdalsfjord.
Saevig (voir Lyngdalsfjord).
Samnangerfjord (Björnefjord).
Sandnaesfjord (Risör).
Skallen (Lofoten).
Skalmen (Aalesund).
Skarnsund (Trondhjemsfjord).
Skjerstadfjord (au dedans de Bodö, au nord-ouest de Bergen).
Skutvik (Malangsfjord).
Söndeledfjord (Risör).
Söndmöre (le district environnant Aalesund).
Sognefjord.
Solsvik (Bergen).
Spildernaes (Malangsfjord).
Stat.
Stavanger.
Storfjord (près d'Aalesund).
Sulefjord (Hjörundfjord).
Sultindsvik (Malangsfjord).
Synaes (Aalesund).
Tampen (haut-fond de ca. 62° N. latitude, 1° E. longitude).
Tenskaerholm (embouchure de Malangsfjord).


Vega
Velfj.
Vikten
Foldenfjord
Namsos
Halten
Froia
Hitteren
Smölen
TRONDHJEM
Kristiansund
Molde
Romsdalsfjord
Aalesund
Stat
Hjörundfjord
NORGE
Florö
Sulen
Sognefjord
Herlö
BERGEN
Hardangerfjord
Björnefjord
OSLO (Kristiania)
Dröbak
Utsire
Karmö
Stavanger
Jæderen
Risör
Egersund
Arendal
Kristianssand
Lindesnes
Skagen
Göteborg
4° E f. Greenw


Nordkap
Sörö
Hammerfest
Porsangerfjord
Laxefjord
Tanafjord
FINMARKEN
Vardö
Varangerfjord
Arnö
Kvænangenfjord
22° E. f. Greenw.
Arnö
Tromsö
Andenes
Senjen
Vesteraalen
Andö
Malangsfjord
Hindö
Narvik
LOFOTEN
VESTFJORDEN
NORGE
Röst
Bodö
Stött
Mo
Dönna
Ranenfjord
Vega
Velfjord
12° E. f. Greenw.

T r o m s ö.
Ullaholm (Aalesund).
U t s i r e.
Vaeringsaet (Sulefjord, Aalesund).
V a r d ö.
Vartdalsfjord (Hareid, Aalesund).
V e s t f j o r d.

Bibliographie des Méduses Norvégiennes.

La Norvège a été pendant le dernier siècle l'une des régions les plus visitées par les zoologistes. Elle a fourni un des premiers et un des plus célèbres naturalistes qui se sont occupés des Méduses, M i c h a e l S a r s, auquel on doit la découverte de la génération alternante de ces animaux. Cependant notre connaissance de la faune médusologique norvégienne s'est developpée fort lentement et est encore très incomplète.

Au moment où commençaient les explorations du vapeur le "Michael Sars" on ne connaissait avec certitude que 17 espèces, et dans la petite collection réunie occasionellement par O. N o r d g a a r d, le naturaliste anglais E. T. B r o w n e pouvait distinguer 10 espèces nouvelles pour la faune, auxquelles H j. B r o c h en a ajouté sept, deux ans plus tard. Il était donc naturel de penser qu'une exploration plus intensive sinon systématique augmenterait notablement ces chiffres. En effet, le littoral norvégien s'étend de la zone boréale à la région arctique, et ses fonds profonds, son archipel (skjaergaard) prodigieux, la mer profonde qui le bordent, offrent une variété de conditions d'existence.

Notre travail confirmera cette opinion. Il passe en revue 55 espèces dont 19 sont nouvelles pour la faune norvégienne, ce qui élève à 58 le nombre des espèces de méduses reconnues avec certitude le long du littoral de Norvège.

Nous croyons utile de donner une liste des travaux scientifiques qui ont trait aux méduses norvégiennes et d'en faire une brève analyse critique. — Ces travaux seront cités à peu près dans l'ordre chronologique. Nous citons les espèces sous les noms employés par l'auteur en y ajoutant entre parenthèse [] le nom que nous

pensons devoir attribuer suivant les règles de la nomenclature moderne. Un signe spécial (*) placé devant le nom indique une espèce nouvelle pour la faune norvégienne.

Liste chronologique des travaux relatifs aux Méduses de Norvège.

1776. O. F. Müller: Zoologiæ Danicæ Prodromus.

1781. — Zoologia Danica. Vol. I.

1835. M. Sars: Beskrivelser og Iagttagelser over nogle mærkelige eller nye i Havet ved den Bergenske Kyst levende Dyr.

1836. C. G. Ehrenberg: Die Akalephen des rothen Meeres und der Organismus der Medusen der Ostsee.

1841. M. Sars: Ueber die Entwickelung der *Medusa aurita* und der *Cyanea capillata*. — Archiv f. Naturgesch., Jahrg. VII.

1846. — Fauna littoralis Norvegiae. Heft I.

1851. — Beretning om en i Sommeren 1849 foretagen zoologisk Reise i Lofoten og Finmarken. — Nyt Magazin for Naturvidensk. Bd. 6.

1859. — Om Ammeslægten *Corymorpha* og dens Arter samt de af disse opammede Meduser. — Christiania Vidensk. Selsk. Forhandlinger.

1863. — Geologiske og zoologiske Iagttagelser, anstillede paa en Reise i en Deel af Trondhjems Stift i Sommeren 1862. — Nyt Magazin for Naturvidensk.

1866. A. Boeck: Om to tilsyneladende bilateral-symmetriske Hydromeduser: *Dipleurosoma typica* og *Stuvitzii*. — Vidensk. Meddel. naturhist. Foren. København.

1875. Fr. E. Schultze: Coelenterata. — Zoolog. Ergebn. der Nordseefahrt vom 21. Juli bis 9. Sept. 1872. — Jahresber. d. Comm. z. wiss. Untersuch. der deutschen Meere in Kiel für die Jahre 1872/73.

1879. E. Haeckel: Das System der Medusen.

1898. O. Nordgaard: Undersøgelser i fjordene ved Bergen 1897—98. — Bergens Museums Aarbog.

1900. — Undersøgelser etc. 1899. — ibid. 1900.

1900. Cl. Hartlaub: Einleitung. — Zoolog. Ergebn. einer Untersuchungsfahrt ...... nach der Bäreninsel u. Westspitzbergen .... im Sommer 1898 auf S. M. S. "Olga". — Wissensch. Meeresuntersuch. Abt. Helgoland. N. F. Bd. 4.

1902. E. Vanhöffen: Die craspedoten Medusen der deutschen Tiefsee-Expedition 1898—1899. — I. Trachymedusen. — Wiss. Ergebn. d. d. Tiefsee-Exped. ("Valdivia"), Bd. III.

1903. E. T. Browne: Report on some Medusae from Norway and Spitzbergen. — Bergens Museums Aarbog.

1905. Hj. Broch: Zur Medusenfauna von Norwegen. — ibid.

1905. O. Nordgaard: Hydrographical and Biological Investigations in Norwegian Fiords. — Bergen.

1907. — Mofjordens Naturforhold. — Kgl. Norske Vidensk. Selsk. Skrifter 1906. — Trondhjem.

1907—17. Cl. Hartlaub: Craspedote Medusen. — Nordisches Plankton.

1909. — Ueber *Thaumantias pilosella* Forbes und die neue Lafoëiden-Gattung *Cosmetira*. — Zoolog. Anzeiger. Bd. 34.

1911. O. Nordgaard: Faunistiske og biologiske iakttagelser. — Kgl. norske vidensk. selsk. skrifter 1911. — Trondhjem.

1913. J. Grieg: Bidrag til kundskapen om Hardangerfjordens fauna. — Bergens Museums Aarbok.

1919. P. L. Kramp: Medusæ, I. Leptomedusæ. — The Danish Ingolf-Exped. Vol. V, Part 8.

1921. Aslaug Sverdrup: Planktonundersøkelser fra Kristianiafjorden, Hydromeduser. — Vidensk. selsk. skrifter, I, math.-nat.Kl. — Kristiania.

La première description de méduses capturées dans les eaux norvégiennes est due au célèbre zoologiste danois O. Fr. Müller. Dans son splendide ouvrage "Zoologia Danica" (1776 et 1781) il décrit:

**Medusa hemisphaerica [Phialidium hemisphaericum].*
* — *digitale [Aglantha digitale].*

Toutes deux proviennent de Dröbak dans le fjord de Christiania.

En 1835 M. Sars publie sous le titre "Beskrivelser og Iagttagelser over nogle mærkelige eller nye i Havet ved den Bergenske Kyst levende Dyr" un opuscule qui constitue une date dans la zoologie marine. Pourvu de moyens de travail rudimentaires, mais doué d'une patience et d'un enthousiasme scientifique admirable, le pasteur de Manger décrit et figure une série de formes intéressantes, observées dans le voisinage de Bergen. Parmi elles, se trouvent les méduses suivantes:

**Oceania ampullacea [Leuckartiara octona].*
* — *octocostata [Melicertum octocostatum].*
— *saltatoria [Aglantha digitale].*
* — *tubulosa [Sarsia tubulosa].*
* *Thaumantias multicirrata [Tiaropsis multicirrata].*
— *plana [Obelia sp.].*
* *Cytaeis octopunctata [Rathkea octopunctata].*

De plus il décrit l'hydroïde *Corymorpha nutans* dont la méduse est:

* *Steenstrupia nutans.*

Les noms génériques de la plupart de ces espèces ont été modifiés dans la suite, résultat nécessaire du développement et du progrès de nos connaissances. Mais les descriptions exactes et les dessins caractéristiques de l'excellent observateur norvégien permettent toujours de reconnaître avec certitude les formes qui ont été soumises à son observation. Elles sont d'ailleurs nécessairement les formes les plus communes de la surface.

Dans le même travail, M. Sars décrit sous le nom de *Strobila octoradiata* un organisme fixé remarquable, duquel se détachent de petites méduses. Cette observation capitale est le premier pas vers la découverte de la génération alternante de méduses. En 1841, M. Sars pourra annoncer que ces méduses en se développant, se transforment dans les deux Scyphoméduses les plus communes de Norvège:

* *Aurelia aurita* et
* *Cyanea capillata*

qui sont ainsi ajoutées a la faune norvégienne.

En 1836, C. G. Ehrenberg figure deux méduses provenant de Dröbak. Elles étaient déjà connues. Ce sont:

Oceania pileata [Leuckartiara octona].
Melicertum campanulatum [M. octocostatum].

En 1846, se place l'importante publication du I^er^ fascicule de "Fauna littoralis Norvegiae", où M. Sars décrit la génération alternante des Hydroméduses constatée pour *Syncoryne sarsii* et *Podocoryne carnea.* La méduse provenant du 1^er^ est *Sarsia tubulosa* antérieurement connue. La deuxième est nouvelle. Elle s'appellera dorénavant:

* *Podocoryne carnea.*

M. Sars étendit ses recherches jusqu'au delà du cercle arctique et en 1851, il fournit quelques détails sur la distribution des deux scyphoméduses si fréquentes *Aurelia aurita* et *Cyanea capillata.* C'est le premier essai dans une voie qui ne devait être parcourue que plus d'un demi siècle plus tard. Une autre méduse de grande taille également abondante dans ces parages a été signalée par M. Sars sous le nom d'*Oceania multicirrata.* En 1863, il revint sur cette détermination et l'ayant observée à loisir en plusieurs points de la côte, il l'a décrivit comme une forme nouvelle:

**Staurophora vitrea [St. mertensii].*

En 1859, Sars reprit l'étude du genre *Corymorpha.* Parmi les espèces rapportées à ce genre, il en est une qui fournit une méduse libre appelée par l'auteur

**Steenstrupia globosa [Hybocodon prolifer].*

En résumé M. Sars a signalé l'existence de 13 méduses parfaitement reconnaissable. Une seule, *Oceania saltatoria*, la *Medusa digitale* d'O. Fr. Müller, *Aglantha digitale* des auteurs modernes, était reconnue avant lui.

L'activité des autres naturalistes norvégiens semble s'être tournée vers d'autres groupes. Seul A. Boeck décrivit, en 1866, une petite méduse d'ailleurs très remarquable capturée à Farsund, petit

port de la partie sud occidentale de la côte norvégienne. Il n'en a observé qu'un seul exemplaire qu'il a dénommé:

* *Dipleurosoma typica.*

Cette description ne laisse pas de nous embarrasser beaucoup, car cette méduse n'a pas été retrouvée dans la suite.

Parmi les naturalistes étrangers, de plus en plus nombreux qui ont visité les côtes si riches de la Norvège, nous avons à citer:

Fr. E. Schultze (1875, p. 138). Il a observé au sud de la Norvège une méduse qu'il a dénommée *Phialidium viridicans.* Sa description permet d'y reconnaître *P. hemisphaericum.*

La monographie de Haeckel (1879) ouvre une nouvelle période de l'étude des méduses. Elle est, en partie, basée sur les observations originales faites par l'auteur au cours d'un séjour prolongé à la côte occidentale de Norvège où Haeckel a visité la région de Bergen et le Sognefjord. — Haeckel signale avoir capturé les espèces suivantes:

Nemopsis heteronema n. sp. *[?].*
Thaumantias forbesii n. sp. *[?].*
Dipleurosoma amphitectum n. sp. *[? Willsia stellata].*
* *Polycanna fungina* n. sp. *[Aequorea forskalea].*
Aglantha digitalis.

L'espèce *Nemopsis heteronema* a été décrite d'après des exemplaires provenant de l'Islande (procurés par Steenstrup) et du Sognefjord. Les premiers sont conservés au Musée de Copenhague. Ils appartiennent indubitablement à l'espèce *Bougainvillia principis.* Il est vraisemblable que Haeckel a observé les exemplaires norvégiens vivants. Nous devons penser que sous le nom *Nemopsis heteronema* Haeckel a eu en vue une des espèces norvégiennes de *Bougainvillia.* — *Thaumantias forbesii* est une espèce douteuse. *Dipleurosoma amphitectum* de Sognefjord est également douteuse; en tout cas Mayer a absolument tort en l'identifiant dans sa monographie (1910) avec *D. typica* Boeck. Nous sommes le plus inclinés à croire qu'elle est un exemplaire de *Willsia stellata.*

Intéressante est la capture d'*Aequorea forskalea* décrite sous un des nombreux synonymes *Polycanna fungina.* Nous donnerons les raisons qui nous font penser que cette belle méduse n'est pas autochtone à la côte norvégienne.

La publication de la monographie de Haeckel, loin d'être suivie de travaux nouveaux sur les méduses, a marqué une période de stagnation. Il faudra attendre le début du siècle suivant pour trouver des renseignements nouveaux sur les méduses norvégiennes. Il est donc naturel de donner ici une liste des 15 espèces connues avec certitude en 1879 sous les noms actuellement employés:

Sarsia tubulosa.
Steenstrupia nutans.
Hybocodon prolifer.
Podocoryne carnea.
Rathkea octopunctata.
Leuckartiara octona.
Staurophora mertensii.
Dipleurosoma typica.
Melicertum octocostatum.
Tiaropsis multicirrata.
Phialidium hemisphaericum.
Aequorea forskalea.
Aglantha digitale.
Aurelia aurita
Cyanea capillata.

Comme il est naturel, ce sont là pour la plupart les formes les plus communes, celles que l'on observe le plus souvent à la surface, celles que l'on peut recueillir sans l'emploi d'engins spéciaux.

Il était réservé à la période moderne d'exploration méthodique de faire connaître les méduses qui demeurent généralement dans la profondeur et ces formes bathypélagiques qui caractérisent les bassins profonds des fjords.

Aurivillius (1898) a fait du plankton du Skagerack une étude spéciale, mais les méduses qu'il signale proviennent principalement de la côte suédoise du Bohuslän.

La création de stations biologiques ne pouvait manquer d'amener un progrès dans nos connaissances.

Le directeur de la Station biologique de Bergen O. Nordgaard a signalé dans ses travaux (notamment en 1898) plusieurs

méduses banales: *Sarsia tubulosa, Tiara pileata (Leuckartiara octona), Aurelia aurita, Cyanea capillata,* à côté desquelles se place (en 1900) la découverte intéressante de la première scyphoméduse bathypélagique

* *Periphylla hyacinthina*

dont un exemplaire de grande taille a été capturé en janvier 1895 dans Puddefjord à Bergen.

Aux efforts du même naturaliste, il faut rattacher la constitution de la petite, mais très intéressante collection de méduses étudiées par E. T. Browne (1903). Examinée par un des meilleurs spécialistes en la matière, elle a, de ce chef, pris une valeur particulière et elle contient quelques-unes des formes d'eau profonde les plus curieuses. Browne signale 17 espèces dont 9 sont nouvelles pour la faune norvégienne. Ce sont:

* *Margelopsis hartlaubi* n. sp.
* *Euphysa aurata*
* *Cytæandra areolata [Podocoryne areolata]*
* *Margelis nordgaardii* n. sp. *[Bougainvillia nordgaardii]*
* *Obelia nigra*
* *Mitrocomella fulva* n. sp. *[Mitrocoma polydiademata]*
* *Homoeonema platygonon*
* *Ptychogastria polaris*
* *Solmaris corona.*

Il conviendrait d'ajouter une dixième espèce à cette liste; car, il résulte de la description de l'un des exemplaires determinés comme *Tiara pileata* (individu provenant de Herlöfjord 3.XII.1900) qu'il n'est pas, comme les autres, une *Leuckartiara octona,* mais *Neoturris pileata* dont la présence n'était pas connue à la côte norvégienne. Quant à *Aequorea norvegica* décrite comme espèce nouvelle, c'est une *Aequorea forskalea.*

Ces déterminations ont été reprises dans la suite par O. Nordgaard dans son volumineux essai: Hydrographical and Biological Investigations in Norwegian Fiords (1905).

Dans une autre direction, nous devons au même naturaliste (Nordgaard, 1907) une observation intéressante. Il a attiré l'attention sur les conditions remarquables présentées par le bassin

fermé de Mofjord, véritable Mer Noire en miniature. Nous aurons l'occasion de revenir sur ces constatations. Pour le moment, bornons-nous à signaler que dans les couches intermédiaires de ce bassin entre l'eau douce de surface et l'eau privée d'oxygène du fond on trouve les méduses:

Margelis nordgaardi [Bougainvillia nordgaardii]
Stomobrachium octocostatum [Melicertum octocost.]
Thaumantias sp. [?]
Aglantha rosea [A. digitale]
— *digitalis*
Aurelia aurita

Dès que le vapeur d'exploration "Michael Sars" fut construit en 1900, l'exploration intensive des bassins norvégiens et de la côte norvégienne devait fournir d'amples occasions d'étudier les méduses. Nous avons dit comment furent constituées les collections qui ont servi de base à la présente étude. Une partie de ce matériel a déjà été utilisée, notamment par Hj. Broch qui y a ajouté le produit de ses observations et collections personelles. Comme nous aurons l'occasion d'incorporer la majorité de ces constatations dans nos propres listes, nous nous bornerons à fournir la liste entière des formes observées par Hj. Broch en la faisant accompagner de noms employés dans le présent travail. Les espèces nouvelles pour la faune sont comme toujours relevéés par un *, les espèces n'ayant été prouvées nouvelles pour la faune qu'à révision plus récente sont relevées par un (*). Quant aux espèces n'ayant été trouvées qu'à Skagerack un (S) est en outre ajouté.

* *Sarsia eximia*
— *tubulosa*
* — *gemmifera*
Euphysa aurata
Amphicodon fritillaria [Hybocodon prolifer]
Tiara pileata [Leuckartiara octona]
Cubogaster gemmascens [Lizzia blondina]
Dysmorphosa carnea [Lizzia blondina]
* — *minima [Lizzia blondina]*
Limnorea norvegica n. sp. *[Podocoryne areolata]*

* *Margelis ramosa* (S, Christianiafjord) *[Bougainvillia ramosa]*
(*) — — (Godösund) *[Boug. britannica]*
Margelis principis [?]
— *nordgaardi [Bougainvillia nordgaardii]*
Rathkea octopunctata (S)
Thaumantias hemisphærica [Phialidium hemisph.]
— *forbesi [?]* (S)
Staurophora laciniata [St. mertensii]
Melicertidium octocostatum [Melicertum octoc.]
Obelia lucifera } *[Obelia spp.]*
— *polystyla* }
— *nigra* (S)
Tiaropsis multicirrata
* *Eutimium elephas [Eutima elephas]*
(*) *Irene viridula* [in parte *Cosmetira pilosella*]
* *Tima bairdi* (S)
Polycanna vitrina [Aequorea forskalea]
Aglantha digitalis (S)
— *rosea [A. digitale]*
* *Solmundus glacialis [Aeginopsis laurentii]*
Solmaris corona

Broch lui-même vers la fin de son traité donne une liste des espèces nouvelles pour la Norvège, liste qui, comme il paraît, ne s'accorde pas avec les espèces désignées nouvelles pour la faune dans l'ouvrage que voici.

Dès la première campagne, l'attention fut attirée sur la distribution remarquable de certaines formes, originaires du littoral, et nous avons dit plus haut l'intérêt mis en évidence par le Dr Hjort de la présence au large de grandes quantités de *Cyanea capillata* et d'*Aurelia aurita.*

D'autre part certaines formes particulièrement curieuses ont dès le début exité un vif intérêt. Il en est ainsi pour la méduse trouvée dans les eaux froides du bassin norvégien de l'Atlantique qui, confiée à E. Vanhöffen, a été décrite dans les résultats de l'exploration de la "Valdivia" sous le nom de *Crossota norvegica.*

Nous justifierons les synonymes adoptés dans le corps de notre étude. Pour une espèce seulement nous devons signaler que les

exemplaires recueillis par l'un de nous (Damas) dans le Puddefjord et déterminés par Broch comme *Irene viridula*, examinés dans la suite ont été reconnus comme identiques à la forme *Cosmetira pilosella* des Forbes. Communiqués sur sa demande à Cl. Hartlaub, celui-ci s'est empressé de les décrire sous le nom de *Cosmetira pilosella*. Nous regrettons pour lui que le naturaliste allemand n'aie pas cru devoir indiquer d'une manière complète les circonstances dans lesquelles le matériel lui a été communiqué.

Les progrès énormes que nos connaissances de la faune pélagique ont fait, dans le début de ce siècle, à l'occasion des recherches scientifiques et pratiques de pêcheries, ont trouvé une expression, malheureusement bien imparfaite, dans la publication du Nordisches Plankton de Brandt et Apstein. Les Hydroméduses y ont été traitées par Cl. Hartlaub et les fascicules, qui leur ont été consacrés, constituent une des meilleures parties de cet ouvrage fort inégal. Cette publication intéresse directement l'étude de la faune norvégienne. D'une part, ce travail contient une révision fort approfondie des Hydroméduses et fixe de nombreux points de synonymie. D'autre part, le vapeur allemand d'exploration le "Poseidon" ayant touché à de nombreuses reprises la côte sud occidentale de la Norvège, le sous-directeur du laboratoire de Helgoland a eu l'occasion d'étudier un bon nombre d'espèces norvégiennes, leur apparition saisonnière et leur distribution. — Ce travail avait d'ailleurs été préparé par plusieurs séjours à la côte norvégienne.

Dans son rapport sur le voyage du bateau "Olga" (1900) Hartlaub a signalé la présence dans le nord de la Norvège de nombreux exemplaires de

* *Laodice cruciata [Laodicea undulata]*

espèce commune dont la présence est signalée ainsi pour la première fois.

Dans le Nordisches Plankton (1907 à 1917) se trouve des notes originales relatives aux méduses norvégiennes suivantes:

"Blaue Sarsia" [Sarsia tubulosa]
Corymorpha nutans [Steenstrupia nutans]
— *aurata [Euphysa aurata]*
Rathkea blumenbachii [R. octopunctata]

Leuckartiara octona
* *Bythotiara murrayi*
(*) *Rotundula brochii* n. g., n. sp. *[Tiaranna rotunda]*

De nouvelles localités des *Periphylla hyacinthina* ont été signalées par O. Nordgaard (1911), et par J. Grieg (1913) qui a trouvé cette grande méduse en grands nombres dans le Hardangerfjord.

Enfin Kramp (1919) signale la capture des espèces suivantes:

Staurophora mertensii
Melicertum octocostatum
Mitrocoma polydiademata
Tiaropsis multicirrata
* *Eutonina indicans*

Malgré ces travaux nombreux la connaissance de la faune médusologique norvégienne est encore bien imparfaite. Bien des problèmes restent à solutionner.

En premier lieu, quelques genres très banaux, *Phialidium*, *Obelia*, *Aglantha* mériteraient une révision approfondie. D'autre part, la faune de l'arrière saison n'a été que fort imparfaitement étudiée. Enfin les fjords profonds et le bassin norvégien de l'Atlantique nous réservent encore certainement la surprise de la découverte de formes curieuses.

Nous pensons donc que la faune médusologique de la Norvège s'augmentera de quelques unités.

Mais l'intérêt se trouve surtout dans les études biologiques. L'apparition et la distribution des méduses offrent avec les conditions physiques du milieu des rapports étroits qu'il importe de définir. Pour cela, l'étude monographique de régions restreintes, étudiées d'une manière intensive aux diverses périodes de l'année est indispensable.

Un essai de ce genre a été fait récemment par Aslaug Sverdrup (1921). Nous regrettons de devoir dire qu'il est aussi insuffisant au point de vue systématique qu'au point de vue biologique, ce qui ne doit pas être imputé à blâme à la jeune auteur. C'est la réponse à une question proposée à l'examen, et toute la responsabilité reste avec le professeur qui a dressé la question et guidé

son élève à la tâche. Malgré quelques valables renseignements réels que contient le traité il y a tout de même tant de malentendu, qu'on aurait mieux fait de ne pas l'imprimer. Le traité ne contient rien d'intérêt spécial à l'ouvrage présent.

Nous terminons par une liste des espèces de méduses norvégiennes actuellement connues. Nous y relevons par une astérique (*) les formes signalées ici pour la première fois.

Sarsia eximia Allman
— *tubulosa* (Sars)
— *gemmifera* Forbes
* — *flammea* Hartlaub
Euphysa aurata Forbes
Steenstrupia nutans (Sars)
Hybocodon prolifer A. Agassiz
Margelopsis hartlaubii Browne
* *Eleutheria dichotoma* Quatrefages
Bougainvillia ramosa van Beneden
* — — var. *minima* nov. var.
— *nordgaardii* Browne
* — *britannica* Forbes
* — *superciliaris* L. Agassiz
* — *principis* Steenstrup
Lizzia blondina Forbes
Podocoryne carnea Sars
— *areolata* Alder
Rathkea octopunctata (Sars)
* *Paratiara digitalis* n. g. n. sp.
Tiaranna rotunda (Quoy & Gaimard)
Leuckartiara octona (Fleming)
* — *breviconis* (Murbach & Shearer)
Neoturris pileata (Forskål)
* *Catablema vesicarium* A. Agassiz
Bythotiara murrayi Günther
* *Calycopsis simplex* n. sp.
* *Willsia stellata* Forbes
Laodicea undulata (Forbes & Goodsir)
Staurophora mertensii Brandt

* *Ptychogena crocea* n. sp.
Dipleurosoma typica Boeck
Melicertum octocostatum (Sars)
Mitrocoma polydiademata Romanes
Cosmetira pilosella (Forbes)
Tiaropsis multicirrata (Sars)
* *Halopsis ocellata* A. Agassiz
Obelia nigra Browne
— *spp.*
Phialidium hemisphœricum (L.)
* — *islandicum* Kramp.
* *Octocanna funeraria* (Quoy & Gaymard)
Eutonina indicans (Romanes)
Eutima elephas (Haeckel)
Tima bairdii Johnston
Aequorea forskalea Péron & Lesueur
Ptychogastria polaris (Allman)
Crossota norvegica Vanhöffen
Homoeonema platygonon Maas
Aglantha digitale O. F. Müller
Solmaris corona Keferstein & Ehlers
Aeginopsis laurentii Brandt
Periphylla hyacinthina Faber
* *Atolla bairdii* Fewkes
* *Pelagia noctiluca* (Forskål)
* *Chrysaora hysoscella* (L.)
Aurelia aurita (L.)
Cyanea capillata (L.)
* — *lamarcki* Péron & Lesueur

Partie spéciale.

I. Hydromedusae.

Anthomedusae.

1. *Sarsia tubulosa* (M. Sars).

Matériel:

No.	Date	Situation	Origine	Observations
*1.	1901 5.VII	A hauteur de Henningsvaer	"M. S." stat. 149	
2.	1903 15.IV	Dröbak		12 expl. 2—7 mm d
*3.	1904 20.VII	Entre Godö et Herö	"M. S." stat. 307	
*4.	— 25.VII	Entre Fladskjaer et Nokkelbaaen	— — 321	
*5.	— 25.VII	67° 27' N—13° 15' E		
*6.	— 26.VII	67° 48' N—12° 02' E		
*7.	1906 16.III	Puddefjord	Stat. biol.	De jeunes expl.
8.	— 22.IV	Borgundfjord	"M. S." stat. 113	5 expl. 4—7 mm
*9.	— 23.IV	Aasefjord	— — 114	
10.	— 25 IV	Aalesund		27 expl. 2—7 mm
*11.	— 26.IV	A hauteur de Giskö	— — 132	
*12.	— 26.IV	Björnebaaen—Karlsbaaen	— — 134	
*13.	— 30.IV	62° 38' N—5° 25' E.	— — 156	
14.	— V	Puddefjord	Stat. biol.	7 expl. $1^1/_2$—5 mr
15.	— 1.V	Lepsö—Haramsö	"M. S." stat. 165	7 expl. 3—$7^1/_2$ m
*16.	— 10.V	60° 45' N.—4° 39' E.	— — 177	
*17.	— 12.V	Björnefjord—Lysefjord	— — 181	
18.	— 12.V	A hauteur de Utsire	— — 184	3 expl. 11—12 mn
*19.	— 22.V	Borgundfjord		
20.	— 28.V	Haröfjord	"M. S." stat. 207	14 expl. 6—15 mn
*21.	— 28.V	63° 21' N—6° 14' E.	— — 211	
22.	— 30.V	Hessefjord	— — 223	
*23.	— 30.V	Vaeringsaet—Hareid	— — 224	
*24.	— 5.VI	Borgundfjord	— — 235	
*25.	— 7.VI	Hjörundfjord	— — 247	
26.	— 7.VII	Hjörundfjord	— — 293	2 expl. 6—11 mm
*27.	— 7.VII	Borgundfjord	— — 303	
28.	— 10.VII	Hjörundfjord	— — 304	3 expl. 11—15 mn
*29.	1908 18.V	Puddefjord	Stat. biol.	
30.	— 23.VI	Entre Klosternaes et Huglen	"M. S." stat. 79	1 expl. 4 mm
31.	— 4.VII	Mastrafjord	— — 121	1 expl. 5 mm
*32.	1909 10.V	Entre Hekkingen et Edö	— — 64	
33.	— 10 V	Entre Spildernaes et Kravik	— — 67	6 expl. 3—6 mm

Date	Situation	Origine			Observations
)9 16.VI	Entre Spildernaes et Kravik	"M. S."	stat.	89	5 expl. 12—17 mm
- 16.VI	Andsnaes—Tenskjaer-holm	—	—	90	
- 16.VI	Aglapsbaaen—Gibostad	—	—	91	3 expl. 8—13 mm
- 16.VI	Hekkingen—Edö	—	—	92	18 expl. 8—15 mm
- 22.VI	69° 45' N—19° 45' E.	—	—	127	2 expl. 12—18 mm
- 22.VI	69° 51' N—19° 49' E.	—	—	128	
- 22.VI	69° 47' N—19° 47' E.	—	—	129	3 expl. 13—14 mm

* D'après le journal du "Michael Sars".
"M. S" = "Michael Sars".
Stat. biol. = Station biologique de Bergen.

Identification:

Il est extrêmement probable mais non absolument certain que la grande *Sarsia* si commune dans les fjords de Norvège, a été rencontrée par Michael Sars et qu'elle est la forme qu'il a décrite sous le nom de *Oceania tubulosa*. C'est la seule forme qui atteigne une demi ligne de hauteur, la seule qui aie des bulbes tentaculaires réellement vésiculeux. M. Sars écrit: "Fire temmelig stærke Randtraade .... som udspringe hver af en aflang Kugle med mörk Kjærne". Le dessin de Sars montre nettement la forme caractéristique du manubrium qui présente une partie basilaire arrondie, une portion non génitale courte et étroite, une portion génitale cinq ou six fois plus longue que la supérieure et un estomac désigné par M. Sars sous le nom de bouche.

L'identification n'est cependant pas absolument certaine. D'une part M. Sars dit positivement que la couleur de l'estomac et des tentacules, seules parties colorées, est un mélange pâle de brun et de gris, parfois de rouge et de jaune; elle est alors moins transparente. C'est là une des variétés de couleur le moins fréquente. Il dit d'autre part que cette méduse apparaît à Florö (près de Bergen) en été et en automne. L'exemplaire qu'il dessine est de taille moyenne. Or, l'époque réelle de l'apparition de notre *Sarsia tubulosa* est le printemps et le début de l'été. Plus tard, on ne trouve habituellement plus que de rares individus de grande taille. Selon Broch (1905, p. 4) *S. tubulosa* a toutefois été recueillie à Puddefjord au mois d'août, et Browne (1903, p. 9) mentionne trois individus de taille moyenne (5—7 mm de hauteur) provenant de Hjeltefjord au commencement de septembre.

N'existerait-il pas à la côte norvégienne plusieurs formes, espèces ou variétés appartenant au groupe *Sarsia tubulosa*? Après la revision que Hartlaub a faite de ces méduses, c'est là une question que nous n'osons trancher.

Quoiqu'il en soit de ces réserves, nous considérons les exemplaires recueillis par Hartlaub à Florö au mois de juillet, ceux de Broch (1905), et les nôtres comme appartenant à la même forme que Sars a décrite et nous les désignons sous le nom de *Sarsia tubulosa*.

Distribution géographique:

Sarsia tubulosa est distribuée à toutes les côtes de l'Europe du Nord depuis la France jusqu'à l'Islande et la Mer de Barentz, elle est pourtant le plus nombreux dans les régions arctiques et subarctiques. Aux côtes septentrionales des îles Britanniques elle est encore commune, mais rare dans La Manche et la partie méridionale de la Mer du Nord. Dans la partie septentrionale de sa distribution elle se présente surtout depuis juin à août, un peu plus tôt dans les régions méridionales.

Apparition saisonnière à la côte de Norvège:

Dès le début du printemps de toutes petites méduses possédant les caractères des *Sarsia* apparaissent en abondance dans les fjords. La cloche est aussi haute que large; les tentacules sont courts, et le manubrium cylindrique fait rarement saillie hors de l'orifice du vélum. Ces méduses sont très actives. Nous croyons pouvoir les rapporter à *Sarsia tubulosa* car l'espèce *eximia* n'est pas représentée dans notre matériel.

Nos notes signalent leur présence dès le 16 mars dans Puddefjord. Ces exemplaires mesurent un ou deux millimètres et sont détachés depuis peu de temps de l'hydroïde. Les spécimens conservés à la date du 15 avril, donc un mois plus tard, mesurent de 2 à 6 mm, et dès la fin du même mois on rencontre côte à côte des spécimens de 2 à 3 mm et d'autres de 8 à 12 mm. Les plus grands offrent déjà un développement considérable des gonades. Cette méduse est excessivement commune en mai. A cette époque, la taille moyenne est environ 10 mm et durant juin et juillet, les

Sarsia atteignent 10 à 16 mm. Plus tard elles deviennent de plus en plus rares.

Nous devons considérer comme tardives les captures faites par Hj. Broch en août (1905, p. 4, Puddefjord) et Browne (1903, p. 9) au début de septembre (Hjeltefjord). Chose curieuse ces dernières *Sarsia* ne mesurent que 5 à 7 mm.

On doit en conclure que *Sarsia tubulosa* est une méduse printanière qui vit jusqu'à la première moitié de l'été. Ce coelentéré se rencontre au maximum pendant cinq mois, de mars à août. Son éclosion est fort limitée comme la durée de sa vie pélagique.

Distribution verticale:

Bien qu'elle remonte à la surface de temps à autres, surtout pendant les temps calmes et les belles journées de mai, cette méduse se tient ordinairement dans les couches intermédiaires à une profondeur comprise entre 20 et 100 m.

Distribution horizontale:

Nous avons récolté cette méduse dans le fjord de Christiania, près de Bergen, à la côte de Romsdal et de Söndmöre et près des Lofoden. Il n'y a pas de doute qu'elle existe le long de toute la côte de Norvège.

Notre liste rapporte peu d'observations sur la présence de cette espèce en pleine mer. Elle peut, certes, avoir échappé plus d'une fois à notre attention; mais comme il s'agit d'une des formes les plus communes de la côte et des mieux connues de tous les naturalistes nous pouvons admettre comme certaine la conclusion suivante: *Sarsia tubulosa* est dans ces parages une forme littorale qui ne s'aventure guère au large. La plus grande distance à laquelle elle a été observée de la côte norvégienne ne dépasse pas 60 milles. Ce fait s'explique par la durée relativement courte du stade pélagique et par la circonstance qu'elle évite en général la surface et est par conséquent retenue dans les eaux intérieures par le mouvement des couches intermédiaires elles-mêmes. Un intérêt particulier s'attache cependant aux individus capturés au large dès le 30 avril et le 10 mai 1906; car ces individus ont subi une dérive qui a duré au maximum 1 mois à six semaines.

2. *Sarsia gemmifera* Forbes.

Matériel:

No.	Date	Situation	Origine	Observations
1.	1905 16.VII	Puddefjord	Stat. biol.	Nombreux exemplai
2.	-- sept.	id.	— —	id.
3.	1908 14.X	id.	— —	id., dont un bourgeons et des

A l'époque où *Sarsia tubulosa* disparaît, une autre espèce la remplace dans le plankton. A la forme de printemps si caractéristique des régions subarctiques et arctiques, succède *Sarsia gemmifera,* espèce plus méridionale puisqu'elle se rencontre dans la Méditerranée, le long des côtes d'Europe jusqu'aux îles Shetland et le Cattegat.

Il eût été intéressant de déterminer avec précision son extension vers le nord. Nous devons pour cela étudier les pêches pélagiques des mois de juillet à octobre, époque à laquelle *S. gemmifera* a été capturée près de Bergen. Nous ne l'avons pas remarquée parmi le matériel si abondant provenant des fjords de la province de Romsdal au début de l'été, ce qui nous porte à lui attribuer pour limite septentrionale le Cap Stat. Mais nous n'osons donner cette conclusion qu'avec réserve, car, à partir du mois d'août, le travail intensif de pêche pélagique du "Michael Sars" était en général suspendu.

D'après notre expérience, *Sarsia gemmifera* se rencontre plus souvent dans le fond des fjords qu'en dehors de la côte et au voisinage des rivages qu'en pleine eau.

3. *Sarsia flammea* (Hartlaub M. S.) Linko.

No.	Date	Situation	Origine	Observations
1.	1907 31.VII	Près de Vardö, surface	"M. S." stat. 1003	14 expl., mesurant 12 mm de hauteur

Identification:

Nos exemplaires ne possèdent pas d'ocelles. Ils ne peuvent par conséquent appartenir à l'espèce d'ailleurs douteuse, *Sarsia brachygaster* Grönberg. Par contre, ils répondent exactement à la dia-

gnose de *S. flammea.* Certains d'entre eux paraissent présenter une chambre apicale peu marquée. Mais comme la base de l'estomac est large, cette chambre apicale n'est peut-être que la paroi supérieure de l'estomac soulevée par une contraction annulaire de la portion basale de l'organe. Ce n'est donc pas une véritable chambre apicale.

Hartlaub (1907, p. 13 et 14) refuse d'admettre que cette méduse ainsi que le pensait Linko (1902 et 1904) aie 4 gonades isolées radialement disposées. Hartlaub a incontestablement raison. Mais l'erreur de Linko est très excusable. A la lumière transmise, on aperçoit sur le manubrium 4 lignes transparentes perradiales (voir fig. 1). Celles-ci ne sont pas dues à des interruptions dans les gonades qui sont continuées (voir fig. 2), mais, à une différenciation de l'endoderme stomacal mince dans les plans perradiaux, épais ailleurs. La paroi stomacale est donc pourvue de 4 bourrelets cellulaires, séparés par 4 sillons profonds; la cavité de l'estomac est cruciforme en section (voir fig. 2). La disposition radiaire est aussi marquée par la présence de quatre bandes musculaires étroites, mais assez puissantes qui courent dans le plan perradial (voir fig. 3). Dans les exemplaires conservés, le manubrium se fend aisément le long de ces lignes.

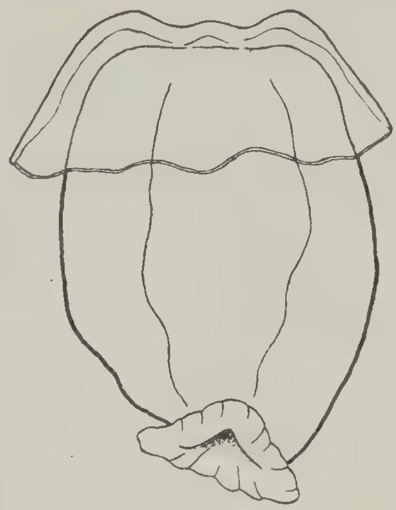


Fig. 1. *Sarsia flammea* Hartlaub. Manubrium et partie supérieure de l'ombrelle.

Chez les individus femelles arrivées à maturité, les gonades ont une apparence bosselée due aux œufs qui sont de grande taille. Il faut aussi remarquer que dans le plus petit de nos exemplaires les gonades sont fort développées.

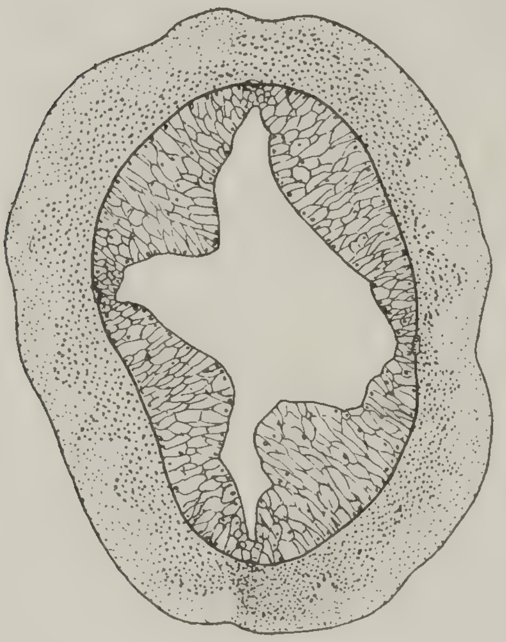
Quatre tentacules présentent une particularité intéressante digne d'être relevée, ils ne se développent pas simultanément. L'un des plus petits individus mesurant 5 mm de hauteur n'a qu'un tentacule complètement formé et trois bulbes tentaculaires notablement plus petits. Il se trouve à un stade Steenstrupia. Chez un autre exemplaire de la même taille, un des tentacules est arraché, les trois autres bulbes portent chacun un tentacule dont l'un est deux fois plus grand que son vis-à-vis; le troisième est de taille intermédiaire. Un individu de $6^1/_2$ mm de hauteur a quatre tentacules de

grandeur différente. Il semble donc que le développement des tentacules aie lieu suivant un cycle défini, que peut représenter la formule: 1 L'inégalité des tentacules est encore visible dans

4 2

3

un autre individu plus grand. Malheureusement, trop peu d'exemplaires sont intacts pour oser affirmer que cette loi du développement est constante. Deux individus montrent une obliquité notable



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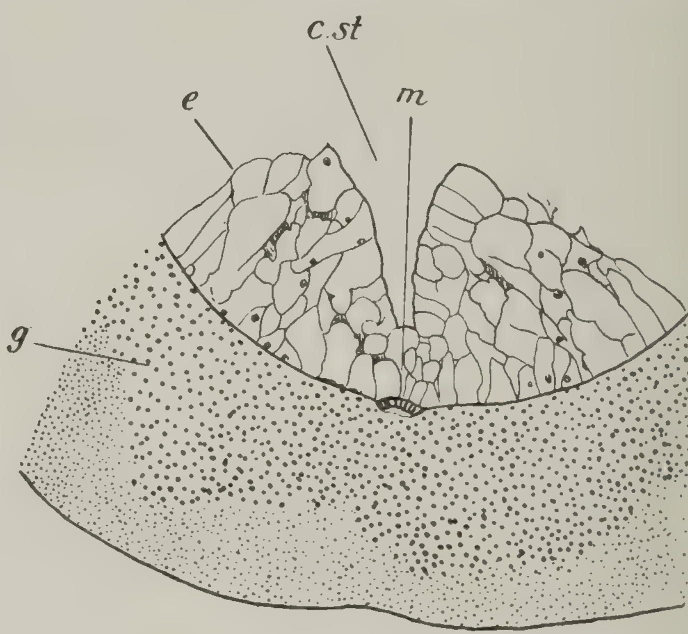

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Fig. 2. *Sarsia flammea* Hartlaub. Section transversale du manubrium d'un individu mâle. — Fig. 3. Partie perradiale de la même section. *c. st.* cavité stomacale ; *e.* endoderme ; *g.* gonade mâle ; *m.* bande musculaire perradiale.

du bord de la cloche. L'ombrelle paraît montrer un développement inégal en rapport avec celui des tentacules. Mais cette bilatéralité apparente pourrait résulter d'une contraction irrégulière de la paroi musculaire de l'ombrelle.

Distribution:

Sarsia flammea est une espèce arctique. Elle est commune au Spitzbergen et dans la Mer de Barentz.

Hartlaub (1907 p. 13) pense en outre que les Sarsia trouvées à Egedesminde (côte occidentale du Grönland) et que Levinsen a déterminées comme *S. eximia* appartiennent à cette espèce. Les exemplaires se trouvent dans le Musée Zoologique de Copenhague, ils n'appartiennent ni à *S. eximia* ni à *S. flammea,* mais ils sont probablement de jeunes exemplaires de *Sarsia tubulosa.*

L'espèce est donc aujourd'hui constatée à la côte norvégienne mais seulement dans les parages de Vardö, c'est à dire au point extrême Nord de la côte.

4. *Euphysa aurata* Forbes.

Matériel:

No.	Date	Situation	Origine	Observations
*1.	1906 31.III	Près d'Aalesund	"M. S." stat. 61	
*2.	— 31.III	Ullaholm—Kroksholm	— — 62	
3.	— 22.IV	Borgundfjord	— — 113	1 expl.
*4.	— 22.IV	Aasefjord	— — 114	
*5.	— 23.V	2 milles E. S. E. de Balta Sound, Shetland	— — 198	
6.	— 27.VI	60° 52' N—0° 36 E.	— — 289	6 expl.
7.	— 28.VI	60° 38' N—2° 35' E.	— — 291	12 expl.
*8.	— 7.VII	Hjörundfjord	— — 293	
9.	— 10.VII	do.	— — 304	3 expl.
*10.	— 25.IX	Byfjord, Bergen	Stat. biol.	
11.	1908 23.VI	Entre Klosternaes et Huglen	"M. S." stat. 79	1 expl.
*12.	— 4.VII	Entre Hodnefjeld et Espholmen	— — 121	
13.	— IX	Herlöfjord	Stat. biol.	1 expl.
14.	— 13.X	do.	— —	1 expl.
*15.	— 13.-14.X	Puddefjord	— —	
*16.	— 11.-12.XI	do. , Herlöfjord, Solsvik	— —	

Cette espèce est répandue depuis le canal de la Manche jusqu'à la côte mourmane. Elle est cependant rare dans la partie méridionale de son aire d'extension, mais devient plus abondante près des côtes d'Écosse, de Norvège et dans le Cattegat. En résumé, c'est une espèce boréale en même temps qu'une forme strictement néritique. Nos observations confirment cette opinion en précisant quelques points:

Les dates de capture renseignées dans le tableau se répartissent entre le 31 mai et le 11 novembre. C'est à dire sur une période de cinq mois, espace de temps relativement long pour une méduse qui n'atteint jamais qu'une faible taille et se réproduit rapidement. L'un de nous a cru observer que les individus capturés

au printemps avaient une ombrelle plus élevée que ceux de l'été et de l'arrière saison, et a pensé qu'ils appartenaient à une espèce ou variété différente de la *Euphysa aurata* typique dont la date d'apparition dans les régions plus méridionales est l'été ou l'automne.

Cependant lors de la révision du matériel, nous n'avons pas cru pouvoir maintenir cette opinion, car les différences de proportion ne sont guère marquées dans le matériel conservé.

Nous connaissons cette méduse des environs de Bergen (Herlöfjord) et de la côte de Romsdal (Borgundfjord, Voksö). Les stations 289 et 291 du "Michael Sars" prouvent aussi qu'elle ne fait pas défaut dans la partie la plus septentrionale du plateau de la mer du Nord sur le banc dénommé Tampen par les Norvégiens.

5. *Steenstrupia nutans* (M. Sars).

Matériel:

No.	Date	Situation	Origine	Observations
1.	1906 23.V	2 milles E.S.E. de Balta-Sound (Shetland) 150-0m	"M. S." stat. 198	
2.	— 28.VI	60^0 N—2^0 35' E.	— — 291	
3	— 3.VII	Hjörundfjord	— — 293	
4.	— 7.VII	ibid.	— — 304	

Il est curieux de constater que cette méduse dont M. Sars a observé le polype et dont il a décrit la libération est en réalité plutôt rare à la côte de Norvège; car, nous ne l'avons observée que deux fois seulement. Il s'agit de deux pêches pélagiques exécutées en eau profonde en juillet 1906 dans le Hjörundfjord. Les autres exemplaires proviennent du voisinage immédiat des îles Shetland où elle paraît beaucoup plus commune.

Steenstrupia nutans est d'ailleurs une méduse fort sporadique et capricieuse: rare à un endroit déterminé une année, elle peut être en abondance l'année suivante. Ce fait s'observe également à la côte de Norvège, car Hartlaub (1907, p. 77) l'a capturée en abondance à Florö au milieu de juillet.

Cette espèce se rencontre le long des côtes européennes depuis le nord de la France jusqu'au sud de l'Islande et elle remonte à la côte de Norvège au moins jusqu'aux Lofoden où son hydroïde

a été recueilli par Sars. Elle est commune aussi bien dans la partie méridionale que septentrionale de son district. Comparée à l'espèce précédente elle a un caractère plus méridional.

6. *Hybocodon prolifer* Ag.

Matériel.

Date	Situation	Origine			Observations
03 15.IV	Dröbak				1 expl.
– 2.V	do.				1 expl.
06 31.III	Ullaholm—Kroksholm	"M. S."	stat.	62	1 expl.
– 2.IV	63° 05' N—6° 38' E.	—	—	80	
– 18.IV	60° 38' N—0° 44' E.	—	—	95	
– 23.IV	Aasefjord	—	—	114, 50—23 m	
– 24.IV	Hjörundfjord	—	—	121, 100—0 m	
– 25.IV	Storfjord	—	—	130, surface	
– 26.IV	Giskö	—	—	132, 75—0 m	
– 26.IV	Björnebaaen—Karlsbaaen	—	—	134, 55—0 m	
– 26.IV	62° 28' 5 N—5° 49' E.	—	—	135, 30—0 m	
– 27.IV	62° 36' N—5° 38' E.	—	—	140, 132—40 m	
– 27.IV	62° 36' N—5° 27' E.	—	—	141, 40—0 m	
– 27.IV	62° 35' N—5° 17' E.	—	—	142	
– 27.IV	62° 34' N—5° 08' E.	—	—	143, surface	
– 28.IV	63° 08' N—6° 29' E.	—	—	145, 55—0 m	
– 28.IV	63° 10' N—6° 14' E.	—	—	146, 40—20 m	
– 30.IV	62° 38' N—5° 25' E.	—	—	156, 45—0 m	
– 30.IV	62° 50' N—5° 22' E.	—	—	159, 90—42 m	
– 1.V	Hessefjord	—	—	163	3 expl., sexués
– 3.V	Lepsö—Haramsö	—	—	165, 60—20 m	
– 3.V	Skalmen—Björlakgrund	—	—	167, 50—0 m	
– 3.V	Haröfjord	—	—	171, 30—0 m	
– 3.V	do.	—	—	172, 40—0 m	
– 4.V	Fjaertoft				1 expl.
– 12.V	Björnefjord	—	—	180, 500—0 m	
–	?	—	—	182, 90—30 m	
– 22.V	60° 40' N—2° 23' E.	—	—	194	
– 22.V	60° 39' N—1° 25' E.	—	—	195, 125—0 m	1 expl.
– 23.V	61° 23' N—0° 22' O.	—	—	199, 130—0 m	
– 26.V	Sulefjord	—	—	205, 437—0 m	
– 27.V	Aspevaagen	—	—	206	4 expl., sexués
– 28.V	Haröfjord	—	—	207, 75—0 m	11 expl.
– 28.V	Björnsund—Galdreskaer	—	—	208	82 expl.
– 28 V	63° 21' N—6° 14' E.	—	—	211, 260—0 m	
– 29.V	63° 10' N—6° 14' E.	—	—	212, 100—0 m	

No.	Date	Situation	Origine	Observations
*37.	1906 30.V	Hessefjord	"M. S." stat. 223	
*38.	— 30.V	Vaeringsaet—Hareid	— — 224	
*39.	1908 23.VI	Klosternaes—Huglen	— — 79, 100—0m	
*40.	1909 10.V	Hekkingen—Edö	— — 64, 100—50 m	
41.	— 10.V	Spildernaes—Kravik	— — 67	6 expl.
*42.	— 10.V	Sultindsvik	— — 68, 50 – 10 m	
*43.	— 16.VI	Spildernaes—Kravik	— — 89	
*44.	— 16.VI	Hekkingen—Edö	— — 92, 50—10 m	

La méduse *Hybocodon prolifer* fréquente toutes les régions boréales des côtes européennes depuis le nord de la France jusqu'au nord de l'Islande; le long de la Norvège elle remonte jusqu'au bord Malang. Elle ne pénètre pas dans les régions strictement arctiques.

Apparition saisonnière:

En 1906, nous avons eu une excellente occasion de suivre cette méduse dans son développement à la côte de Romsdal. Elle apparaît dès les premiers jours du printemps. Les individus capturés le 31 mars montrent déjà un bourgeonnement très actif. Elle devient de plus en plus fréquente dans les fjords pendant les mois d'avril et de mai. Les exemplaires de belle taille capturés alors sont en pleine reproduction asexuée. A la bulbe principale sont appendues de jeunes méduses qui elles-mêmes prolifèrent activement. Le tout forme de grosses grappes. Il n'est pas étonnant dans ces conditions que *Hybocodon prolifer* soit une des méduses les plus communes du plankton de mai dans les fjords. Vers la fin de ce mois, les grappes deviennent de plus en plus petites et le manubrium dont les parois ont été jusque-là minces et transparentes devient épais. Bientôt commence la reproduction sexuelle. Elle débute au milieu du mois de mai. Les derniers bourgeons ne sont pas formés que déjà on trouve des actinula se développant sur la paroi stomacale. La reproduction asexuée prend cependant bientôt fin. Dès le mois de juin il devient rare de rencontrer une méduse portant des bourgeons. Les actinula se maintiennent pendant longtemps dans la cavité de la cloche, on les rencontre également libres et flottantes. Enfin *Hybocodon prolifer* se fait rare, et à la fin du mois de juin elle est à peu près disparue.

Distribution géographique:

La présence de cette méduse dans le fjord de Cristiania est attestée par les échantillons de plankton provenant de Dröbak. Elle est commune près de Bergen. Elle manque rarement dans les pêches pélagiques faites dans les fjords de la côte de Romsdal pendant les mois d'avril et de mai. Enfin, nous pouvons la signaler à la latitude des Lofoden et sur le banc de Malang. Elle est donc présente le long de toute la côte norvégienne comme on pouvait le prévoir. Mais elle ne pénètre pas dans les régions arctiques.

Extrêmement fréquente dans les fjords, elle ne fait pas défaut sur les bancs côtiers. Cependant les captures y sont sporadiques et beaucoup moins riches. Elles ne comportent que des individus isolés. En consultant le journal du "Michael Sars" pour la période du 31 mars au 4 mai, on se fait une bonne idée de sa répartition. — Les pêches pélagiques exécutées à l'aide de filets appropriés forment une série très dense d'observations réparties depuis l'intérieur des fjords jusqu'à la descente continentale et montrent la manière dont cette méduse quittant les fjords et la côte se répand vers le large et se disperse.

Entre le 22 mars et le 2 avril *Hybocodon prolifer* n'y est constatée que deux fois dans le skjaergaard et sur le banc d'Ona.

Par contre, durant la deuxième série d'observations un mois plus tard, nous la trouvons consignée fort souvent, soit dans l'archipel extérieur, soit sur le Skreigrund, soit près d'Onagrund, mais elle paraît très rare à une distance plus grande et au-dessus de profondeurs supérieures à cent brasses. Nous ne l'avons constatée nulle part au delà de la descente continentale.

Il en est de même pendant la période du 28 mai au 21 juin.

Donc, en quittant la côte qui est son lieu d'origine *Hybocodon prolifer* se disperse au large et devient de plus en plus rare. Le plateau côtier de Romsdal dont la profondeur n'excède pas 200 brasses lui permet de se répandre au large. Mais en dehors de ce relief sousmarin, dans les eaux océaniques proprement dites, elle disparaît, perdue dans le Gulf-Stream.

L'étude du plateau de la Mer du Nord conduit à des constatations identiques. *Hybocodon* s'y rencontre en dedans de l'isobathe de 200 m mais ne s'étend pas au delà.

7. *Margelopsis hartlaubi* Browne.

Matériel:

No.	Date	Situation	Origine	Observations
1.	1909 sept.	Herlöfjord	Stat. biol.	1 expl.
2.	— —	—	— —	ca. 300 m, 2 expl.

Description:

Cette espèce a été décrite par Browne en 1903; elle est peu connue; aussi nous croyons utile d'en donner une description spécifique nouvelle et une figure (fig. 4).

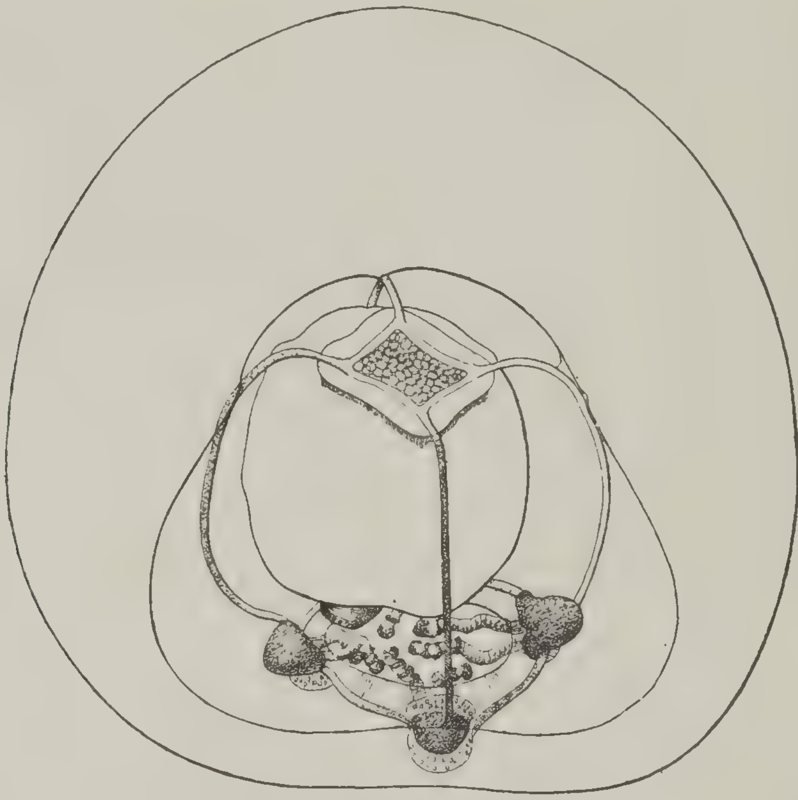


Fig. 4. *Margelopsis hartlaubi* Browne.

L'ombrelle est sphérique et l'exombrelle est garnie de nématocystes très disséminés. La mésoglée est fort épaisse surtout au sommet. La consistance en est très molle. Le manubrium volumineux occupe une grande partie de la cavité de la cloche. Sa base est quadrilatère et dépourvue de produits génitaux. La gonade unique occupe toute la région moyenne qui prend la forme d'un cube ou d'un tonnelet. La portion orale est conique ou cylindrique et la marge de la bouche est garnie d'un cercle de nématocystes. Les quatre canaux radiaires sont étroits et transparents. Les quatre bulbes tentaculaires sont épaisses et triangulaires, dépourvues d'ocelles. Elles portent chacune deux ou trois tentacules dont la base est dépourvue de nématocystes, tandis que la portion distale noyeuse est terminée par un bouton urticant. Le vélum est fort.

La mésoglée et les canaux radiaires sont d'une transparence parfaite et incolore. L'estomac, les bulbes et les nœuds des tentacules sont chargés de cette teinte rouge brique très intense qui s'observe chez tant d'animaux de zones intermédiaires. La taille de l'adulte varie entre 3 et 4 mm.

Cette description diffère en quelques points de celle de Browne. Signalons notamment l'existence d'une portion basale de l'estomac, libre de produits génitaux; la forme cubique que prend ordinairement l'estomac dilaté par les gonades; la présence occasionelle d'un troisième tentacule sur les bulbes marginales. Enfin, nous pouvons donner des éclaircissements certains sur la couleur des individus vivants.

Distribution:

Les exemplaires décrits par Browne avaient été capturés dans Osterfjord (entre 400 et 200 m) et Herlöfjord (entre 400 m et la surface) dans les mois d'avril, juin et septembre. C'est dans les mêmes endroits que nous l'avons capturée également et toujours dans la profondeur, en septembre 1909. Nous pouvons donc confirmer qu'il s'agit ici d'une espèce bathypélagique.

8. *Eleutheria dichotoma* Quatrefages.

Matériel:

Date	Situation	Origine	Observations
06 20.IX	Herlöfjord	Stat. biol., 200 m	
08 29.X	Solsvik	— —	
- 5.XI	do.	— —	
- 11.-12.X	do.	— —	

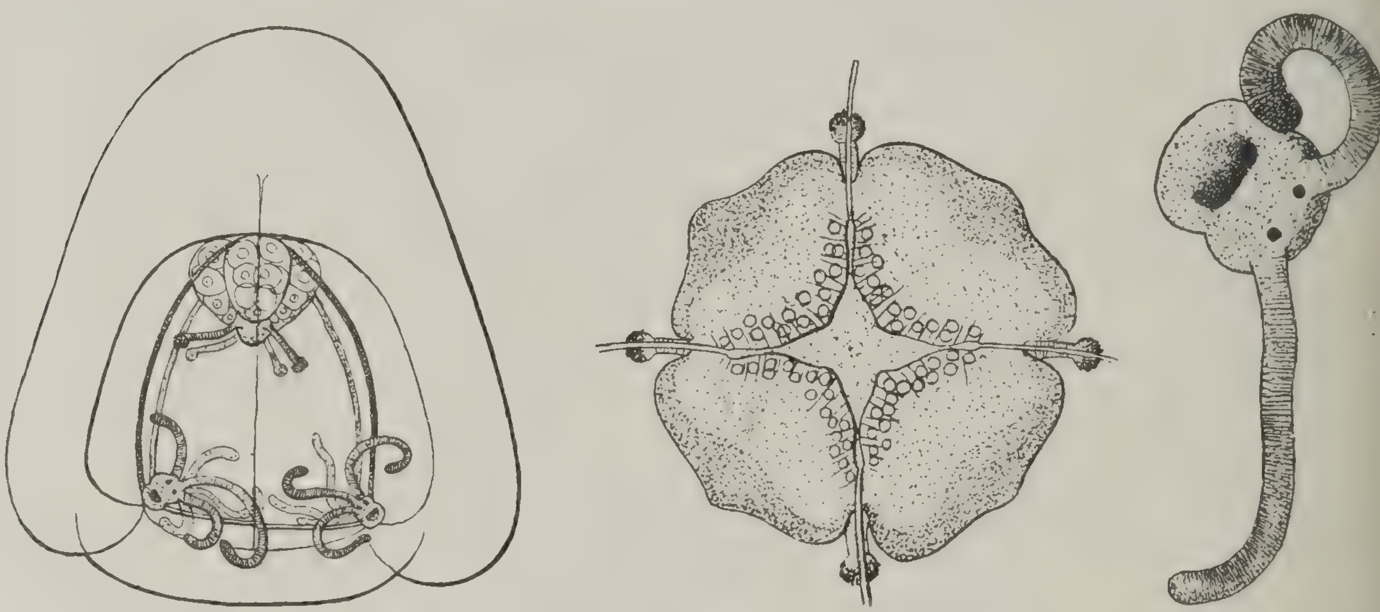
A quatre reprises différentes, nos pêches pélagiques d'arrière-saison ont contenu une petite méduse rudimentaire présentant les caractères d'une *Eleutheria*. Chaque fois, il s'agissait d'individus isolés. Nous n'avons pu en faire une étude aussi détaillée que l'aurait mérité un genre remarquable à beaucoup de titres. Nous nous bornons à faire remarquer: que ces exemplaires ne présentaient aucune trace de gonades ni de bourgeons; qu'ils possédaient six tentacules bifurqués relativement courts; qu'ils ont été capturés en pleine eau et non au milieu des algues où se rencontrent habi-

tuellement, rampantes, les *Eleutheria*; enfin que l'époque de ces captures est très tardive.

Nous ne pouvons que signaler cette espèce curieuse à l'attention des naturalistes norvégiens.

9. *Bougainvillia ramosa* var. *minima* nov. var.

Nous avons trouvé dans Nordaasvand, au sud de Bergen, le 18 août 1908 dans un coup de filet traîné à deux ou trois mètres sous la surface, un grand nombre d'individus d'une fort petite *Bou-*



5. 6. 7.

Fig. 5–7. *Bougainvillia ramosa* var. *minima* nov. var. — Fig. 5. Entière méduse, individu femelle. — Fig. 6. Vue dorsale du manubrium d'un individu mâle. — Fig. 7. Bulbe tentaculaire avec deux tentacules.

gainvillia — mesurants à peine 1 mm de haut — qui, malgré leur faible taille, sont à maturité complète.

La forme de l'ombrelle varie quelque peu (fig. 5). En général, elle est le plus large à son ouverture, se rétrécit vers le haut. La mésoglée est toujours très épaisse, tant sur les côtés que vers le sommet où elle se renfle. Le manubrium est petit et porte quatre gonades interradiales qui chez l'individu femelle sont à peu près sphériques et contiennent un nombre assez faible d'œufs. Chez l'individu mâle, elles sont plus aplaties, et un faible prolongement conique gélatineux de la sous-ombrelle remplit en partie l'espace quadrilataire laissé dans la paroi dorsale du manubrium entre les quatre testicules (fig. 6). Cette disposition par conséquent rappelle

à un degré moindre celle qui existe souvent chez l'individu mâle de *B. ramosa* typique. Un peu au dessus du cône buccal s'attachent quatre tentacules oraux que l'animal tient ordinairement relevés vers le haut. Ils sont pour la plupart simples. Quelques rares individus montrent cependant un ou deux tentacules bifurqués. Ils ont alors deux branches terminales fort courtes. Les bulbes marginales sont pourvues de deux et chez les individus les plus grands de trois tentacules et garnies de deux ocelles noires arrondies (fig. 7).

Si nous faisons abstraction du développement fort avancé des gonades, et de la mésoglée particulièrement épaisse, cette petite méduse ne se distingue en aucune façon de jeunes *B. ramosa* typiques. Ces individus ne constituent certainement qu'une variété à maturité hâtive de cette espèce.

Bougainvillia ramosa a, le long des côtes européennes, une distribution nettement méridionale. Cette méduse est signalée dans la Baie de Gascogne, le long des côtes sud des îles Britanniques, dans la partie méridionale de la Mer du Nord et dans les eaux danoises. On peut la trouver depuis juillet jusqu'en novembre; mais elle est le plus fréquente d'août à octobre.

Ni la méduse, ni l'hydroïde n'étaient jusqu'à présent connus à la côte d'ouest norvégienne; et la forme typique n'y a pas été constatée. Par contre, nous avons ici une forme aberrante, une variété naine qui a été capturée en grand nombre dans une seule localité. Il convient par conséquent de décrire cet endroit d'une manière un peu plus exacte.

Nordaasvand constitue un bassin presque fermé, une sorte de grand lac marin dont la profondeur atteint à certains endroits près de 80 m. Vers l'ouest, il communique avec la mer par un chenal très étroit et profond seulement de quelques pieds. A la surface l'eau a une salinité peu élevée, elle peut être presque douce et gèle en hiver. Cette couche superficielle est cependant fort mince et recouvre une eau qui demeure salée parce que périodiquement elle reçoit par le chenal un afflux d'eau marine à salinité élevée. Cette eau qui demeure stagnante a à toutes saisons une température relativement élevée. Ces circonstances hydrographiques réalisées dans Nordaasvand se rapprochent par conséquent de celles que Helland Hansen a si bien analysées et décrites dans son

travail sur les huitrières norvégiennes sans toutefois avoir le caractère aussi exagéré qu'à Indreö. Nordaasvand constitue en effet un bassin beaucoup plus vaste et le renouvellement de l'eau y est beaucoup plus fréquent de sorte que l'écart dans les températures vis-à-vis de la normale n'est pas aussi considérable et le recul des saisons moins accusé.

Il convient cependant de signaler ici que le même échantillon de plankton récolté en août 1908 contient de petites *Cyanea capillata* mesurant 2 à 3 cm de diamètre, ainsi qu'un Péridinien très spécial que l'un de nous (Damas) a retrouvé à Villefranche dans la Méditerranée.

Connaît-on d'autres formes naines de *Bougainvillia ramosa*? Oui, dans la Méditerranée. Hartlaub décrit (1911, p. 189, note) une *Bougainvillia ramosa* var. *nana* de Trieste. A en juger par la description cette forme ressemble dans sa structure et par sa taille à la variété norvégienne, dont elle ne diffère que par le fait que ses tentacules oraux sont divisés deux fois. En dehors de cette observation *B. ramosa* n'est pas signalée dans la Méditerranée. Il est très intéressant de constater que la forme divergente de Norvège ressemble si fortement à celle de la Méditerranée. Ce fait se relie admirablement à ces autres constatations qui prouvent que dans les bassins fermées à température relativement élevée de Norvège, on trouve des espèces animales qui, étrangères à ces latitudes élevées, sont à proprement parler méridionales.

10. *Bougainvillia nordgaardii* Browne.

Matériel.

No.	Date	Situation	Origine	Observations
*1.	1905 4.X	Puddefjord	Stat. biol.	expl.s de Broch
*2.	1906 16.VIII	62° 12' N—0° 50' E.	"M. S." stat. 350, 200 m wire	1 expl. de grand ta
3.	— IX	Moldefjord		4 expl., 3-4 mm de h
4.	1907 2.IV	Mofjord		10 expl., 2—4 mm
5.	— 28.VIII	Hjeltefjord		5 expl., jusqu'à 2
6.	— 29.VIII	do.		1 expl., $2^1/_2$ mm
*7.	1908 13.VIII	Puddefjord		
*8.	— 11.-12.IX	do.		
9.	— IX	Herlöfjord, ca. 100 m		nombreux expl., 2-
10.	— X	do, 300 m		1 expl., 2 mm

Date	Situation	Origine	Observations
1908 13.X	Puddefjord	Stat. biol.	4 expl., $1^1/_2$—3 mm
— 20.X	Solsvik		
— 27.X	Puddefjord		
— 11.XI	do.		7 expl., $1—3^1/_2$ mm

Description:

Cette espèce qui n'a été décrite que par Browne (1903, p. 14) d'après trois individus récoltés par Nordgaard et que Broch signale dans sa liste des Méduses, mérite une description nouvelle.

Adulte: Nos plus grands exemplaires mesurent de 4 à 5 mm de haut, leur forme générale est cubique, un peu plus haute que large. L'exombrelle porte quatre sillons perradiaires et quatre sillons interradiaires et se soulève comme chez la plupart des Margellides en huit côtes arrondies. Vers le haut elle forme un léger cône apical. La plus grande largeur est au niveau du $^1/_3$ inférieur.

La mésoglée n'est pas très épaisse, sauf au sommet où elle fait saillie dans la cavité de la cloche sous la forme d'un court pédoncule conique.

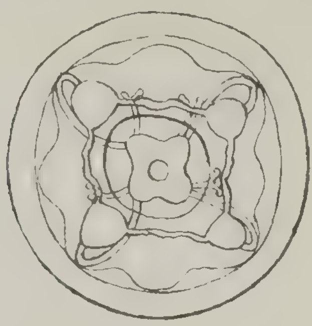
Le manubrium varie beaucoup dans sa forme. Conique et très petit dans le jeune il emplit une grande partie de la cavité sous-ombrellaire chez l'adulte. Il a la forme d'une pyramide quadrangulaire dont la base est légèrement rétrécie et déprimée au centre dont les angles se prolongent dans les canaux radiaires. Le bord net forme un bourrelet. Les quatre faces de la pyramide sont saillantes et séparées par des sillons perradiaires, de sorte que les quatre bourrelets génitaux sont épais et isolés. Remplis par les produits génitaux, ils sont convexes, lisses chez le mâle, mamelonnés chez la femelle par suite de la présence des follicules saillants à la surface. La partie orale est courte, son ouverture carrée est limitée par une lèvre régulière.

Les tentacules buccaux insérés à la base de la portion orale ne sont pas fort grands. Nous comptons chez un adulte 6 ou 7 divisions dichotomiques. Les branches se terminent chacune par un bouton urticant médiocre.

Les canaux radiaires débouchent dans l'estomac par une partie en trompette. $^1/_8$ de leur longueur environ est compris dans le pédoncule stomacal. Ils sont réguliers et étroits.

Les groupes de tentacules marginaux comprennent une bulbe tentaculaire portant chez l'adulte 5 à 7 tentacules qui offrent avec

la marge de l'ombrelle les rapports ordinaires chez les Margellides. Cette bulbe occupe à peu près $^1/_5$ de la longueur du canal circu-



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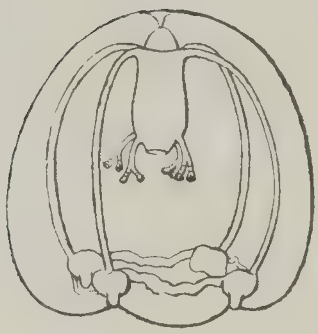

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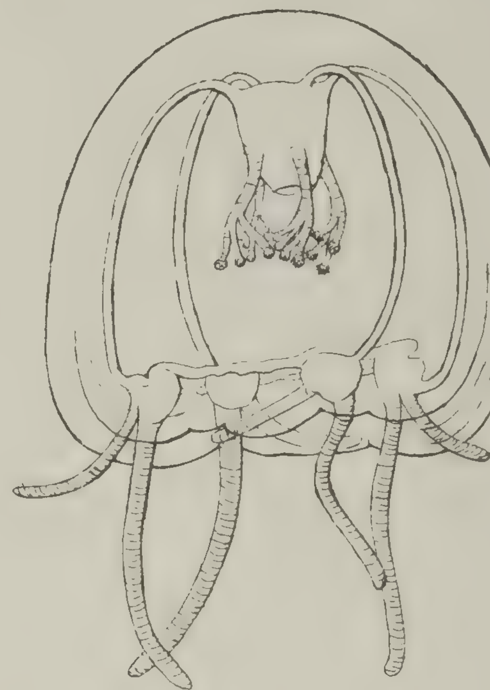

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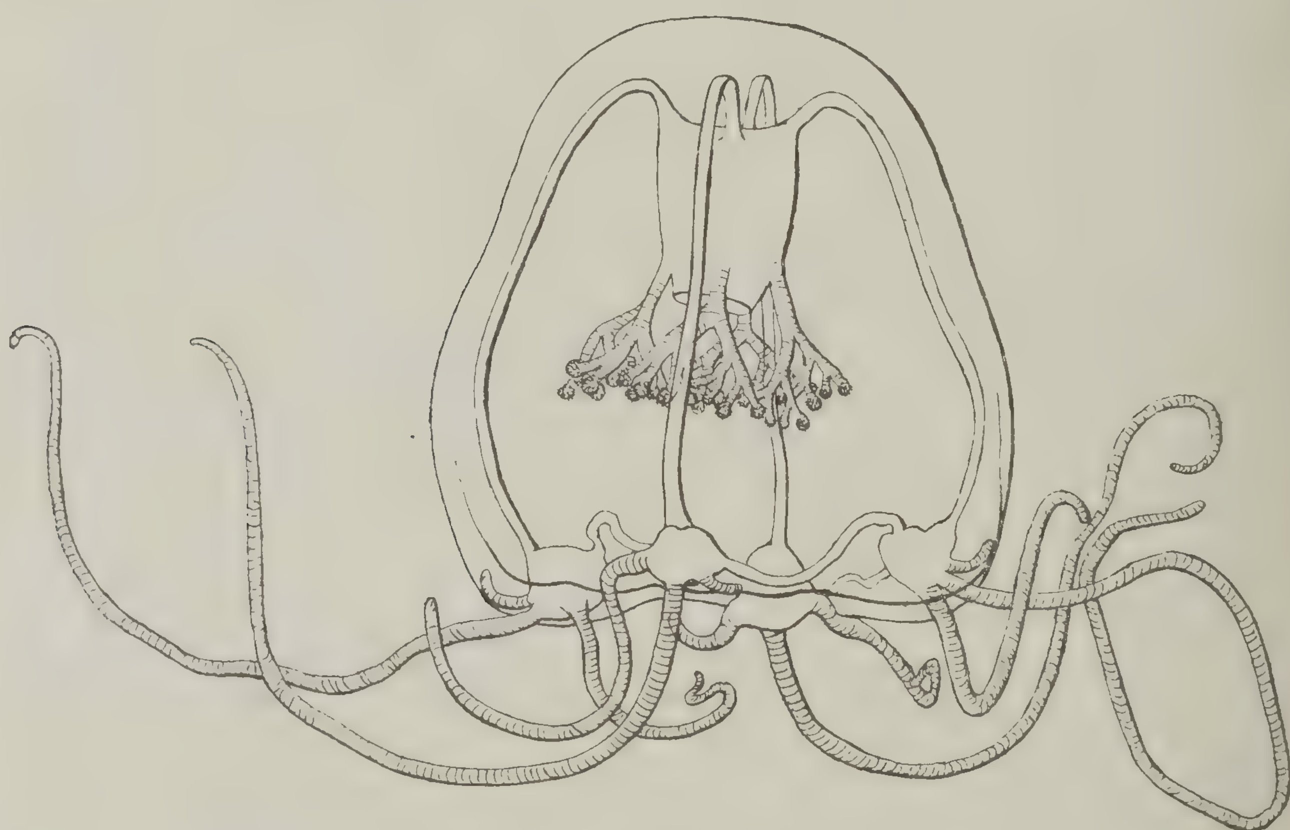

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Fig. 8—11. *Bougainvillia nordgaardii* Browne. — Fig. 8. Stade 1, vue orale. — Fig. 9. Stade 1, vue latérale. — Fig. 10. Stade 3. — Fig. 11. Stade 4.

laire. Les tentacules sont de taille différente, à peu près aussi longs que la cloche et également épais dans toute leur longueur. Ils sont portés relevés vers le haut pendant la vie.

L'absence d'ocelles a été constatée sur le vivant.

Le vélum est étroit.

Le manubrium et les bulbes tentaculaires sont d'une couleur rouge orangée du plus beau brillant. La partie ectodermique aussi bien que la portion endodermique des bulbes est colorée. Sinon, les autres organes sont tout-à-fait transparents avec un léger reflet irisé.

Parmi les particularités de cette espèce, nous relèverons outre l'absence totale d'ocelles, la mineur relative de la mésoglée; la présence d'un pédoncule stomacal court, mais net; la subdivision des tentacules buccaux fort poussée par rapport à la taille de l'animal, et enfin la forme des gonades. Celles-ci forment toujours une croix qui n'est jamais marquée de plis interradiaux comme par exemple chez *B. britannica* et *B. superciliaris.* Dans les jeunes individus, elles peuvent être déprimées, mais jamais plissées.

La génération hydroïde de cette méduse n'est pas connue. Par contre, le matériel conservé contient une série complète de stades de développement depuis la méduse récemment libérée jusqu'aux stades adultes. L'étude appofrondie de ce matériel prouve que le développement de la méduse s'accomplit suivant une règle dont il se départit rarement.

La jeune méduse a déjà d'une manière générale la forme de l'adulte. Parfois, mais pas toujours, le rapport de la hauteur de l'ombrelle vis-à-vis de la largeur est plus petit que chez l'adulte. La méduse nouvellement éclose mesure 1 mm de hauteur, et déjà à la taille de $1^1/_2$—$1^3/_4$ mm le pédoncule stomacal se montre. Nous l'avons même constaté nettement chez deux individus de $1^1/_4$ mm de hauteur. Les ocelles font totalement défaut.

Stade 1 (fig. 8—9): Chose remarquable, *Bougainvillia nordgaardii* ne possède à sa libération aucun tentacule. L'individu le plus jeune observé (Hjeltefjord 28 août 1907) mesure 1 mm de haut. Le canal apical vient de se fermer mais s'aperçoit sous la forme d'une invagination profonde en entonnoir de l'exombrelle qui se porte à la rencontre d'une évagination correspondante de l'estomac. Chacune des bulbes marginales assez grandes laisse voir la première ébauche du 1^er^ tentacule. D'autre part, les tentacules buccaux sont bien développés et chacun d'eux porte au bout d'une manche assez longue une fourche simple.

Stade 2: 1 tentacule sur chaque bulbe. La hauteur est de $1^1/_2$ mm, le canal apical a complètement disparu. Chaque bulbe porte

un tentacule complètement développé. Les tentacules buccaux commencent à se diviser une seconde fois par voie dichotomique. Ce procès n'est pas encore terminé sur tous les tentacules buccaux.

Stade 3 (Fig. 10): 2 tentacules marginaux. Hauteur $1^1/_2$—$1^3/_4$ mm. Le tentacule n° 2 se forme toujours à gauche du n° 1 (quand

Fig. 12. *Bougainvillia nordgaardii* Browne. Individu en stade 6 (voir le texte).

les bulbes marginales sont regardées du côté exombrellaire) et tandis que celui-ci continue à être dirigé dans le plan perradial, celui-là pointe obliquement sur le côté. Tandis que le tentacule marginal n° 2 est encore tout petit, la 2e division dichotomique des tentacules buccaux s'accomplit. C'est à ce stade que le pédoncule stomacal commence à se former.

Stade 4 (fig. 11): 3 tentacules. — Hauteur 2—$2^1/_2$ mm. Les tentacules n° 3 se forment à droite du n° 1; en même temps la subdivision des tentacules buccaux se poursuit et quand le tentacule marginal n° 3 est à peu près aussi long que la bulbe tentaculaire, tous les tentacules oraux sont divisés 3 fois dichotomiquement. Les branches de 4e ordre apparaissent avant la formation du 4e tentacule marginal. A ce stade, débute la formation des gonades.

Stade 5: 4 tentacules. — Hauteur ca. 5 mm. Le tentacule marginal n° 4 se forme à gauche du n° 2; lorsque sa longueur atteint celle de la bulbe, tous les tentacules oraux sont divisés 4 fois.

Stade 6 (fig. 12): Après ce stade les tentacules buccaux ne continuent pas à se diviser aussi vite que se forment les tentacules marginaux. Chez un individu haut de $5^1/_4$ mm, dont le tentacule n° 5 situé à droite du n° 3 est moitié aussi long que les autres, les tentacules oraux poussent leur 5e branche qui n'est pas encore complètement formée.

Les individus adultes mesurant environ 5 mm de hauteur portent sur chaque bulbe jusqu'à 7 tentacules marginaux bien développés et l'ébauche d'un huitième. Leurs tentacules oraux sont ordinairement divisés dichotomiquement 6 fois. Certaines branches peuvent avoir une 7e division, qui ne paraît pas accomplie chez tous les tentacules du même individu.

La régularité parfaite que nous observons dans le développement des tentacules marginaux est très remarquable. Elle montre qu'il n'y a dans la structure de la méduse aucun indice de disposition bilatérale (cf. Broch 1905, p. 6). Le tentacule n° 2 apparaît sur chaque bulbe marginale à gauche du n° 1, le n° 3 à droite, le n° 4 à gauche et ainsi de suite. Cette loi se vérifie même chez l'adulte. Les 5 ou 6 tentacules du milieu sont en fait de même longueur, mais il y a toujours un jeune tentacule en voie de développement sur l'un des côtés. Il est situé à droite si le nombre total est 7, à gauche s'il y en a 8. Nous avons en vain cherché une exception à cette règle dans notre matériel.

Hartlaub a observé une indication du même fait chez la jeune *B. ramosa* pourvue de deux tentacules sur chacune des bulbes marginales (1911, p. 188 et fig. 166 p. 187). Cet auteur remarque que les deux tentacules ne sont pas égaux et que chez les exemplaires qu'il a étudiés: "war stets der, vom Radiärkanal

aus gesehen, links liegende Tentakel und Ocellus stärker und offenbar früher entwickelt". Si nous comprenons bien Hartlaub (son expression "vom Radiärkanal aus gesehen" n'est pas absolument claire) le 2e tentacule se forme chez *B. ramosa* tout comme chez *B. nordgaardii.*

Si nous rapportons sans réserve les jeunes stades ici décrits à l'espèce *B. nordgaardii*, ce n'est pas seulement parce qu'ils sont reliés par une série complète de stades de transition avec la forme adulte. Même isolées, ces jeunes méduses ne pourraient être rapportées qu'à cette espèce dont les caractéristiques se retrouvent dans des stades jeunes, à savoir: la mésoglée relativement mince, la vaste cavité sous-ombrellaire, le pédoncule stomacal, l'absence d'ocelles et la subdivision des tentacules oraux relativement poussée par rapport à la taille de l'animal.

On connaît les stades jeunes de toutes les autres espèces nordiques de *Bougainvillia*, à l'exception de *B. principis*. Un individu de 4 mm appartenant à cette dernière espèce se trouve dans notre matériel et représente incontestablement le stade le plus jeune connu jusqu'à présent de cette espèce: Il est arrondi en sphère et a déjà des bulbes tentaculaires fort larges; les tentacules oraux sont divisés à partir de leur base; le manubrium est en forme de croix. Nos jeunes *B. nordgaardii* se distinguent, d'autre part, des *B. superciliaris* et *B. ramosa* de même taille par l'absence d'ocelles. Ceux-ci sont très visibles dès les stades les plus jeunes des deux espèces. De plus, *B. nordgaardii* se distingue des stades jeunes de *B. ramosa* par ses tentacules oraux divisés. Les premiers âges de *B. britannica* ont été décrits d'une manière approfondie par Hartlaub (1911, p. 168). Ils n'ont qu'un tentacule sur chaque bulbe, et les ocelles se montrent seulement aux stades à trois tentacules. Mais chez *B. britannica* pourvue de 2 tentacules sur chaque bulbe les tentacules oraux ne sont pas encore divisés tandis que chez *B. nordgaardii* ils sont déjà, à cet âge, ramifiés deux fois. De plus, on a signalé chez la jeune *B. britannica*, "in der dorsalen Wandung des Magens eine ziemlich grosse Ansammlung schwarzer Pigmentes" dont il n'y a pas de trace chez *B. nordgaardii.*

Distribution:

Cette espèce n'est connue jusqu'à présent que des environs immédiats de Bergen: Puddefjord, Herlöfjord, Hjeltefjord, Osterfjord,

et d'ailleurs dans Mofjord (Nordgaard 1907), bassin profond sépare par une ancienne moraine de Osterfjord. Mais si nous ne l'avons pas constatée dans des conditions géographiques analogues dans les fjords profonds de la province de Romsdal, la capture de plusieurs spécimens dans le fjord de Molde suffit à prouver qu'elle est répandue le long de la côte occidentale.

Tous ces spécimens proviennent de profondeurs notables comme aussi ceux de Browne. C'est incontestablement une forme qui évite la surface sans être proprement un animal bathypélagique au sens réel du mot.

Elle a été capturée pendant le mois d'août, de septembre, d'octobre et de novembre. Son apparition tardive explique suffisamment son absence dans les pêches pélagiques si productives exécutées pendant le printemps et l'été 1906 à la côte de Romsdal. Nous n'hésitons donc pas à la déclarer une forme d'été et d'automne. Aussi considérons-nous comme insolite la capture de 11 exemplaires recueillis le 2 avril 1907 dans Mofjord et la capture en le même lieu le 1 mai 1903, nommé par Nordgaard (1907). Nous aurons à revenir sur cette observation qui ne reste pas isolée dans nos constatations biologiques.

11. *Bougainvillia britannica* Forbes.

12. *Bougainvillia superciliaris* L. Agassiz.

13. *Bougainvillia principis* (Steenstrup).

Nous traiterons en un seul chapitre de ces trois espèces qui constituent un groupe très homogène. Hartlaub (1911) en a fait une révision approfondie. Il en a suivi le développement et décrit les caractères différentiels, aux divers âges. On doit les considérer comme définitivement établies.

Nous n'avons malheureusement pu utiliser dans une mesure complète le matériel considérable de *Bougainvillia* qu'ont procuré les pêches pélagiques du "Michael Sars". A l'époque où elles furent exécutées, la révision du genre n'était pas faite d'une manière précise. Aussi, nous devons négliger les nombreuses notes du journal indiquant la présence des *Bougainvillia* déterminées tantôt comme *B. superciliaris*, tantôt comme *B. principis.* Force nous est de nous borner à publier trois listes dressées après la révision attentive que l'un de nous (Kramp) a faite du matériel conservé.

Matériel:

Bougainvillia britannica Forbes.

No.	Date	Situation	Origine			Observations
1.	1904 21.VI	Hasdalen (Risör)	"M. S."			36 expl., 4-9 mm de h
2.	— 24.VI	58° 11' N—10° 26' E.	"M. S."	stat.	230	23 expl., 4—9 mm
3.	— 27.VI	57° 48' N—9° 21' E.	—	—	237	
4.	— 1.VII	55° 46' N—2° 35' E.	—	—	262	
5.	1905 24.VI	Godösund	—			2 expl.
6.	1906 28 VI	60° 38' N—2° 35' E., 110—115 m	—	—	291	4 expl., 3—6 mm
7.	— 24.VII	Au large d'Arendal	—	—	313	17 expl.

Bougainvillia superciliaris L. Ag.

No.	Date	Situation	Origine			Observations
1.	1900 4.IX	74° 07' N—19° 04' E.	"M. S."	stat.	61	6 expl., adultes
2.	1901 28.VII	Green-Harbour (Spitzbergen).	—			2 expl.
3.	1906 16.III	Puddefjord	—	—	1	1 expl., très jeune
4.	— 22.IV	Borgundfjord	—			1 expl, 3 mm de ha
5.	1907 31.VII	Près de Vardö	—	—	1003	11 expl., 5—8 mm

Bougainvillia principis (Steenstrup).

No.	Date	Situation	Origine			Observations
1.	1906 1.V	Hessefjord	"M. S."	stat.	163	1 jeune expl., 3 mm de
2.	— 12.V	Samnangerfjord	—	—	179	1 expl., taille moyen
3.	— 12.V	Björnefjord	—	—	181	2 expl, taille moyen
4.	— 22 V	60° 40' N—2° 23' E.	—	—	194	1 grand expl.
5.	— 23.V	2 milles E S.E. de Balta Sound, Shetland	—	—	198	4 expl. adultes, 7—7¹
6.	— 26.V	Sulefjord	—	—	205	2 grands expl.
7.	— 28.V	Haröfjord	—	—	207	2 expl.
8.	— 28.V	Björnsund—Galdreskjaer	—	—	208	2 grands expl.
9.	— 11.VII	Hjörundfjord	—	—	305	2 grands expl.
10.	— 23.VIII	64° 00' N—5° 40' E.	—	—	364	1 grand expl
11.	1908 22.V	Au large de Förde	—	—	11	2 expl., taille moyen
12.	— 23.VI	Entre Klosternaes et Huglen	—	—	79	7 expl., taille moyen
13.	1909 16 VI	Entre Spildernaes et Kravik (Malangsfjord)	—	—	89	1 expl., taille moyen

Si incomplets que soient ces documents, ils confirment et précisent ce qui est déjà connu du caractère biologique de ces espèces si répandues.

Bougainvillia britannica, forme commune autour des îles Brittanniques dans le canal de la Manche fréquente dans la Mer du Nord (obs. 4) d'où elle pénètre dans le Skagerack (obs. 2 et 3) et

le Cattegat, est l'espèce la plus méridionale. Elle se rencontre encore sur le plateau profond de la Mer du Nord (obs. 6) et dans les parages des Shetlands. A la côte méridionale de la Norvège, elle paraît fréquente. Nous la signalons près de Risör (obs. 1) et au large d'Arendal (obs. 7). Aslaug Sverdrup (1921) a trouvé cette méduse dans le fjord de Christiania en mai et en juillet. Elle remonte à la côte occidentale au moins jusqu'au fjord de Hardanger. L'individu d'ailleurs jeune qui provient de Godösund (obs. 5) avait été examiné par Hj. Broch et déterminé comme *ramosa.*

Bougainvillia superciliaris a son domaine principal dans les régions arctiques; mais elle descend vers le sud. Trouvée une fois près des côtes d'Écosse, elle apparaît régulièrement à Helgoland et dans les eaux danoises. Hartlaub (1911, p. 173) a trouvé son hydroïde à Mandal à la côte sud de la Norvège, et nous pouvons la signaler aujourd'hui près de Bergen (obs. 3) et d'Aalesund (obs. 4) respectivement dans le Puddefjord et le Borgundfjord.

Ces individus, recueillis dans les parties méridionales de l'aire géographique de cette méduse arctique, se présentent au début du printemps, tandis que dans le nord, l'espèce est fréquente durant les mois d'été.

Bougainvillia principis offre un caractère intermédiaire aux deux formes précédentes. Son domaine principal est justement la côte occidentale de la Norvège où ont été faites principalement nos pêches pélagiques, de sorte que notre liste de capture est particulièrement fournie. Abondante du nord du cercle polaire (obs. 11, 12, 13), elle est surtout fréquente dans les fjords du Romsdal où les pêches pélagiques de mai et de juin en ont capturé des centaines d'échantillons, elle nous paraît déjà plus rare dans les parages de Bergen et du Hardanger. Elle a été retrouvée dans la Mer du Nord (obs. 4) et près des Shetlands (obs. 5). On l'a signalée également en Écosse, en Irlande et même à Helgoland où elle apparaît occasionellement. Nous l'avons capturée dans la Mer du Nord près de la côte danoise, et Broch croît l'avoir reconnue dans le fjord de Sandnaes en juillet.

En résumé, ces trois espèces sont étagées le long de la côte du nord de l'Europe. En allant du sud au nord, on passe du domaine de *Bougainvillia britannica* à celui de *B. principis* pour entrer dans celui de *B. superciliaris*, espèce circumpolaire. Mais chacune déborde sur sa voisine sans que ces divers domaines soient parfaitement séparés.

14. *Lizzia blondina* (Forbes).

Matériel:

No.	Date	Situation	Origine	Observations
1.	1905 sept.	Puddefjord	Stat. biol.	15 expl., tous bourgeonnants
2.	1908 13. oct.	do.	— —	4 expl., 2 bourgeonnants, 2 se
3.	— 21.-27. oct.	do.	— —	1 expl., ♀ à de grands œufs
4.	— Fin d'oct.	Os, Björnefjord	— —	1 expl., ♀ sexuée

Cette espèce est fort bien connue par les études de Chun sur le développement et la révision qu'en ont donné Browne et Hartlaub.

Broch (1905, p. 6) signale avec quelque réserve, il est vrai, que *Cubogaster gemmascens* Haeckel s'observe dans le Puddefjord

Fig. 13—14. *Lizzia blondina* (Forbes). — Fig. 13. Individu à trois tentacules. — Fig. 14. Manubrium portant des bourgeons médusoïdes.

en grande quantité aux mois d'août et de septembre. Mayer (1910, p. 133) admet que l'espèce de Haeckel est une jeune *Rathkea octopunctata* anomale. Cependant la figure de Haeckel ne permet pas de douter qu'il s'agit en réalité d'une *Lizzia blondina* qui n'a développé que deux tentacules. C'est aussi l'opinion de Hartlaub (1911. p. 164). On sait que cette espèce possède,

à l'état de développement complet, trois tentacules sur chacune des bulbes perradiaires, un sur chacune des bulbes interradiaires. Mais la formule tentaculaire de la méduse même adulte varie beaucoup. Aucun des exemplaires norvégiens conservés n'a plus de 8 tentacules en tout. Souvent même tous les huit ne sont pas complètement développés. La figure ci-contre (fig. 13) montre un individu arrivé à maturité sexuelle capturé dans le Puddefjord le 13 octobre 1908. Il n'a que trois tentacules. Le nombre peut donc en être réduit au stade sexué.

Nos observations faites à la station biologique de Bergen pendant les étés et les automnes 1905 à 1908 promettent de donner une première image approchée de l'apparition et du développement de cette espèce. Nous la rencontrons à partir du mois de septembre. Les individus portent alors de nombreux bourgeons sur le manubrium. Les plus grands prolifèrent déjà avant d'être détachés du progéniteur (fig, 14); de sorte que la réproduction à cette époque est très active. Cette jolie petite méduse devient, par conséquent, fort fréquente. Mais dès le début d'octobre la reproduction asexuée tire à sa fin. Les bourgeons développés sur la paroi du manubrium en une spirale se rapproche de l'extrémité distale laissant libre la portion proximale dans laquelle se développent les produits génitaux. Ainsi les individus capturés le 14 octobre 1908 montrent à côté de bourgeons de diverses grandeurs des œufs saillants sur la base du manubrium.

Bientôt la production de bourgeons cesse. En même temps la méduse devient plus rare. Nos captures les plus tardives sont du 27 octobre 1908.

Répartition géographique:

Cette petite méduse, qui affectionne des eaux de surface, semble ne pas s'avanturer loin du rivage. Du moins près de Bergen, l'avons-nous trouvée beaucoup plus souvent dans le fond du Puddefjord au voisinage immédiat de la station biologique et près du bord qu'au milieu du vaste Herlöfjord. Nous reviendrons dans la partie générale sur ce phénomène qui n'est pas isolé.

L'apparition tardive de cette méduse nous a empêché d'en déterminer la distribution horizontale. Rencontrée par Broch et par nous-mêmes près de Bergen, nous pouvons la signaler également à Os dans le Björnefjord.

Elle existe certainement le long de toute la côte sud, mais nous regrettons de ne pouvoir déterminer la limite septentrionale de cette espèce qui a un caractère boréal accentué.

15. *Podocoryne areolata* Alder.

Syn. Cytaeandra areolata Haeckel 1879.
Lymnorea borealis Mayer 1900.
Limnorea norvegica Broch 1905, p. 5.

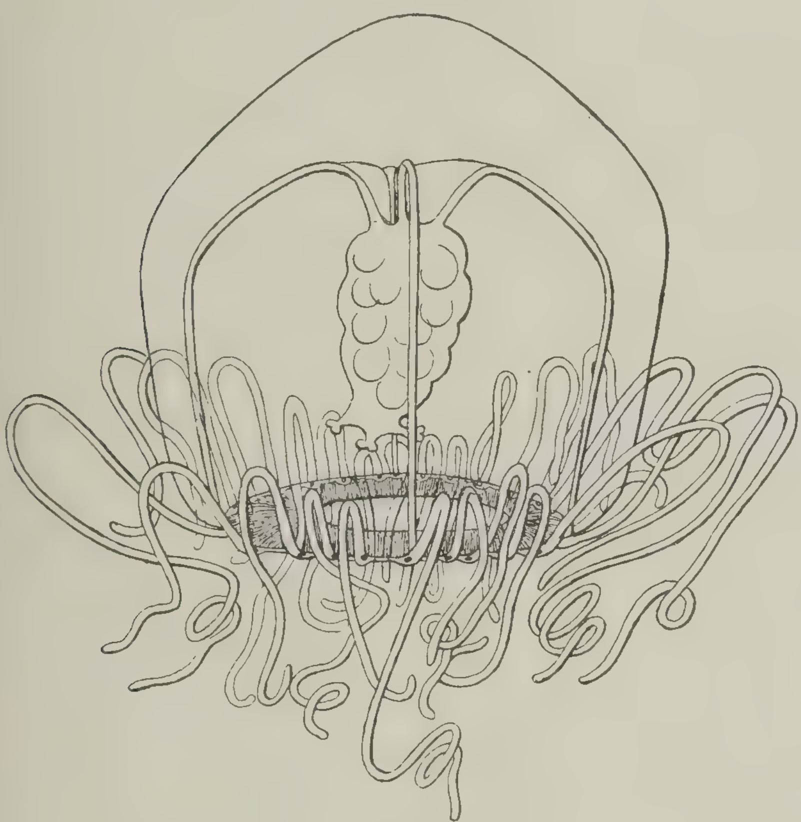
Matériel:

No.	Date	Situation	Origine	Observations
1.	1905 25.V	62° 43' N—3° 43' E.	"M. S." stat. 30	1 expl. $1^3/_4$ mm de ha
2.	1906 16.III	Puddefjord	— — 1	2 expl. 2—$2^1/_2$ mm
*3.	— 24.III	62° 30' N—4° 58' E.	— — 49	
4.	— V	Puddefjord	Stat. biol.	2 expl. 1—3 mm
5.	— 12.V	Samnangerfjord	"M. S." stat. 179	1 expl. $2^1/_2$ mm
*6.	— 12.V	Björnefjord	— — 180	
*7.	— 19.-21.V	Feje	— — 190	
*8.	— 22.V	60° 40' N—2° 23' E.	— — 194	
9.	— 22.V	60° 39' N—1° 25' E.	— — 195	1 expl. 2 mm
10.	— 23.V	2 milles E.S E de Balta Sound, Shetland	— — 198	1 expl.
11.	— 29.V	63° 10' N—6° 14' E.	— — 212	1 expl. $2^1/_2$ mm
12.	— 11.VI	Storfjord	— — 253c 400 m wire	1 expl. 3 mm
13.	— 28.VI	60° 38' N—2° 35' E.	"M. S." stat. 291	1 expl. $2^1/_2$ mm
*14.	— 10.VII	Hjörundfjord	— — 304	
*15.	1907 IX	Herlöfjord	Stat. biol.	
16.	— 29 X	Hjeltefjord	— —	1 petit expl.
17.	— 6.XII	Mofjord	— —	1 expl. 3 mm
*18.	1908 2.VI	Christianiafjord	"M. S." stat. 42	
19.	— IX	Herlöfjord	Stat. biol.	2 expl. $1^1/_4$—$1^1/_2$ mm
20.	— X	do.	— —	1 expl. 3 mm
21.	— 21.-27.X	Puddefjord	— —	1 expl. $1^1/_4$ mm
*22.	— 27.X	Solsvik	— —	
23.	— 11.-12.XI	Puddefjord	— —	5 expl. 1—2 mm

Identification:

Il n'y a aucune raison de créer pour cette espèce un genre spécial *Cytaeandra*. Elle ne diffère des *Podocoryne carnea* complètement développées et possédant 32 tentacules telles qu'on les connaît à la côte orientale de l'Amérique du nord que par le fait que ses quatre bras oraux sont divisés dichotomiquement, et par la présence d'un pédoncule stomacal court, mais cependant bien net.

Les bras buccaux sont divisés deux ou trois fois chez les plus grands exemplaires norvégiens (fig. 16). Ces divisions sont assez irrégulières. Un sillon profond marque la face inférieure des bras buccaux. Elle se poursuit sur leurs ramifications (voir fig. 17). L'armature buccale répond complètement à la figure que Mayer donne des bras buccaux chez *Lymnorea borealis* et comme cette espèce ressemble en tous les autres points à *P. areolata*, nous ne doutons pas que les deux espèces sont identiques. C'est aussi l'opinion de Mayer (1910) et de Hartlaub (1911).



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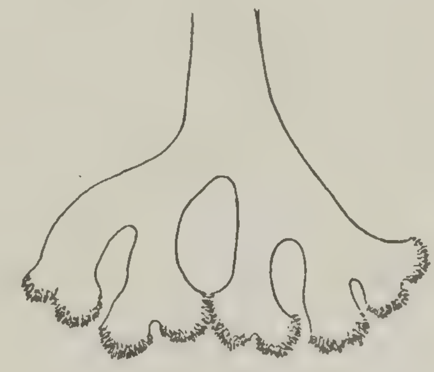


16.

17.

Fig. 15—17. *Podocoryne areolata* Alder. — Fig. 15. Vue laterale de la méduse. — Fig. 16. Vue aborale d'un bras buccal. — Fig. 17. Vue orale d'un bras buccal, démontrant le sillon poursuivant les ramifications, et l'armature de nématocystes.

Hartlaub se montre sceptique par rapport à *Limnorea norvegica* de Broch (1905). Dans notre matériel se trouve un des exemplaires étudiés par Broch ("M. S." stat. 30). Il appartient sans aucun doute à *P. areolata*. Hartlaub reproduit in extenso la description de Broch[1]). Ce qui semble le faire hésiter à admettre l'identité des deux espèces est que "die kurzen Mundgriffel paarig in den vier Ecken der sehr weiten Mundöffnung zu sitzen scheinen". En

[1]) Après les mots "westlich von Stat" Hartlaub se permet un *(sic!)* qui donne à penser que Broch a oublié le numéro d'ordre de la "station". Faut-il lui apprendre que Stat est le nom du cap au delà duquel la côte norvégienne d'abord orientée du S. au N. tourne du SO au NE.

fait l'ouverture buccale peut être extrêmement large dans cette espèce. L'estomac peut se contracter si fort dans le sens dorso-ventral qu'il devient plus de deux fois plus large que haut, tandis que étendu le rapport est inverse. Dans l'état fortement élargi, les tentacules buccaux paraissent exactement comme Broch les a décrits.

Nous n'ajouterons que quelques mots à la description complète de Hartlaub. Ils se rapportent au nombre des tentacules chez des individus de taille diverse. L'espèce offre sous ce rapport une grande variabilité.

Dans notre matériel se trouve un petit individu, récemment libéré si l'on en juge par la présence du canal apical; il mesure $1\frac{1}{4}$ mm de haut et il a 8 tentacules dont 4 interradiaux un peu plus petits que les 4 perradiaux et en outre 8 ébauches tentaculaires adradiales. Outre un individu pourvu de 7 tentacules, nous en avons un mesurant $1\frac{1}{4}$ mm, qui n'en a que 5, à savoir 4 longs perradiaux et un cinquième interradial presque aussi long, mais plus mince. Dans cet individu les bras oraux sont indivisés, tandis que dans l'individu nouvellement libéré il y a déjà un indice de division.

Une certaine variabilité se montre également dans la rapidité de développement des tentacules ultérieurs. Un individu mesurant $1\frac{1}{2}$ mm a le plus souvent 8 tentacules. Dans certain cas, les 4 interradiaux sont tous semblables; dans d'autres cas, ils sont de grandeurs différentes. Parfois cependant ces petits individus ont déjà 16 tentacules bien développés. Les individus de $2\frac{1}{2}$ mm ont le plus souvent 16 tentacules, mais peuvent en avoir beaucoup plus: nous avons observé les nombres 20, 28, 32 et 41. Dans ce dernier individu ($2\frac{1}{2}$ mm de haut), les 8 tentacules perradiaux et interradiaux sont à peu près également forts, les autres beaucoup plus petits et à peu près égaux entre eux. Chez un exemplaire de 3 mm et possédant 26 tentacules, ils montraient tous les stades de transition depuis de tout petits jusqu'à de complètement développés, sans aucune régularité apparente. Chez des individus de 3—4 mm nous avons compté 20 à 32 tentacules.

Apparition saisonnière:

Cette méduse n'est jamais très abondante. Elle se rencontre isolément et d'une manière irrégulière. Par compensation, elle

s'observe aux époques les plus variées et notre liste de capture la signale en mars, avril, mai, juin, octobre, novembre et décembre. Browne (1903, p. 12) la mentionne des fjords aux environs de Bergen en avril et mai. Il y a lieu d'admettre que cette forme se détache de l'hydroïde aux époques les plus variées puisque nous avons recueilli de jeunes exemplaires aussi bien en juillet (Moldefjord) qu'en novembre (Puddefjord) et qu'en même temps nous observons des individus adultes. Mais, cette petite méduse n'a probablement pas une vie pélagique prolongée.

Distribution géographique:

Elle se rencontre le long de la côte méridionale et occidentale de la Norvège où nous pouvons la signaler dans le fjord de Christiania, dans Björnefjord, aux environs de Bergen (tant dans les fjords intérieurs Puddefjord, Herlöfjord et Hjeltefjord que dans le skjaergaard à Solsvik et Feje), dans le bassin fermé de Mofjord, aux environs d'Aalesund (Storfjord) et près de Molde.

Sa présence sur les bancs côtiers est documentée par la station 212 du "Michael Sars" (obs. 11) ainsi que son existence dans le nord de la Mer du Nord (obs. 8) et près des Shetlands (obs. 10).

16. *Rathkea octopunctata* (M. Sars).

Matériel:

Date	Situation	Origine			Observations
03 15.-18.IV	Dröbak				nombreux. expl., bourgeonnants
– 10.IV	Puddefjord	Stat. biol.			
06 14.III	do.	"M. S."	stat.	1	
– 24.IV	Vartdalsfjord	—	—	123	
– 25 IV	Giskö—Haramsö	—	—	130	4 expl. bourg.
– V	Puddefjord	Stat. biol.			plusieurs expl. bourg.
– 10.V	60° 42' N—4° 22' E.	"M. S."	stat.	174	
– 11.V	60° 43' N—4° 29' E.	—	—	175	
– 12.V	Samnangerfjord	—	—	179	
– 12.V	Björnefjord—Lysefjord	—	—	181	
– 21.V	Feje	—	—	190	
– 22.V	60° 39' N—1° 25' E.	—	—	195	
– 28.V	Haröfjord	—	—	207	
– 30.V	Hessefjord	—	—	223	
– 30.V	Vaeringsaet—Hareid	—	—	224	

No.	Date	Situation	Origine	Observations
*16.	1906 1.VI	61° 15' N—1° 15' E.	"M. S." stat. 232	
17.	— 7.VII	Hjörundfjord	— — 247	1 expl. sexué
18.	1907 1.III	Puddefjord	Stat. biol.	4 expl. bourg.
19.	— 31.VII	Vardö	"M. S." stat. 1003	nombreux expl. se[illegible]
*20.	1908 17.VII	Lyngdalsfjord	— — 160	
21.	— XI	Puddefjord	Stat. biol.	1 expl. bourg.

Rathkea octopunctata est une des méduses les plus communes pendant le printemps aux côtes de l'Europe du Nord, depuis la France jusqu'à l'Islande et la Mer Blanche. Aux côtes de la Norvège elle a tout d'abord été constatée à Florö par M. Sars. Dans le fjord de Christiania Asl. Sverdrup (1921, p. 21) ne l'a trouvée qu'une seule fois en avril, ce qui est assez étrange. Broch (1905, p. 6) la mentionne de la côte de Skagerack en mars et avril; dans Herlöfjord et Hjeltefjord près de Bergen elle fut trouvée en mars et avril 1901 (Browne 1903, p. 15). Enfin Hartlaub (1911, p. 231) l'a trouvée dans le Sund de Tromsö le 8 juin.

Cette belle petite méduse que son double mode de reproduction rend si intéressante, a pu être suivie pas à pas dans son cycle annuel.

Elle apparaît dans le plankton dès les premiers jours de mars. Le 1 mars 1907, nous en avons capturé plusieurs exemplaires près de la station biologique de Bergen (Puddefjord). L'un très petit, nouvellement détaché ne possédait que six tentacules. Trois autres portaient déjà des bourgeons. En 1906, un filet suspendu du bord du "Michael Sars" de façon à filtrer le courant à 5 m de profondeur en a également procuré plusieurs spécimens, tandis que les pêches pélagiques, faites dans les environs d'Aalesund pendant le même mois, ne nous l'ont pas fait constater.

Le mois de mars répond donc à sa première apparition à la latitude de Bergen et il y a un léger retard dans son éclosion au nord du Cap Stat.

Elle devient bientôt très commune. Sans doute de nouveaux individus détachés de l'hydroïde viennent se mêler aux premiers libérés. Mais, le bourgeonnement très actif pendant tout le mois d'avril explique surtout sa multiplication rapide. Aussi nous avons noté dans notre journal que *Rathkea octopunctata* se trouve dans toutes les nombreuses prises de plankton effectuées dans les fjords de Romsdal pendant le mois d'avril et de mai et de juin. Partout,

on pouvait l'observer comme de petites taches noires au milieu de la masse gélatineuse de méduses que le filet pélagique rapportait de quelques mètres sous la surface. Nous n'avons pas conservé des exemplaires de chaque station, et souvent cette petite forme a été négligée dans les listes succintes et nécessairement incomplètes de formes typiques dressées à bord. Le tableau des captures donne donc une idée insuffisante de sa répartition. Il suffit cependant pour documenter la fréquence de cette forme. Elle devient rare après le mois de juillet et ce n'est pas sans surprise que nous l'avons retrouvée au mois de novembre dans le Puddefjord. En total, c'est une espèce commune qui se rencontre depuis le fjord de Christiania jusqu'à Vardö.

Au large, nous la signalons dans la Fosse norvégienne à la hauteur de Bergen (obs. 7 et 8), ainsi que sur le plateau de la Mer du Nord (obs. 12 et 16).

17. *Paratiara digitalis* n. g., n. sp.

Matériel:

Date	Situation	Origine	Observations
07 31.VII	Vardö	"M. S." stat. 1003	2 individus

Description:

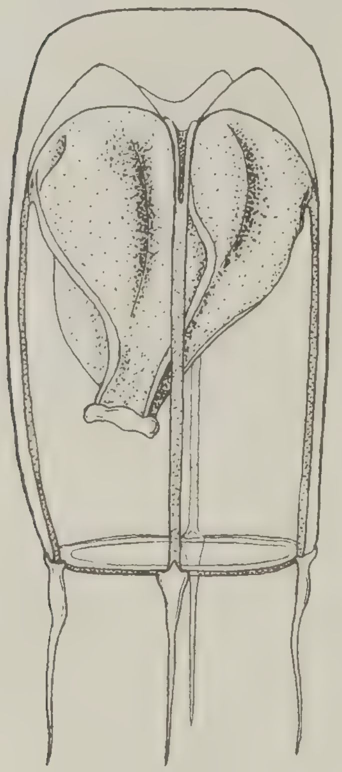
Nous considérons comme représentant un genre et une espèce nouvelle deux individus capturés à la surface le 31 juillet 1907 à la station 1003 du "Michael Sars" au voisinage de Vardö. Nous connaissons encore cette forme par deux exemplaires recueillis au sud de l'Islande.

L'ombrelle haute de 10 mm est deux fois plus haute que large. Les parois de la cloche sont minces. La mésoglée un peu épaissie en sommet, régulièrement arrondie ou un peu aplatie. Le manubrium est en forme de bouteille; il atteint les $^2/_3$ de la longueur de la cavité de la cloche et est soudé dans son $^1/_3$ supérieur avec la sous-ombrelle le long des quatre canaux radiés, de sorte que la cavité de la cloche se prolonge dans chaque interradius en un entonnoir apical (voir fig. 18).

Les quatre lèvres sont simples (fig. 19). Le manubrium offre, en coupe, une section cruciforme par suite de la présence de 4

profonds sillons interradiaux, et ses angles saillants perradiaux sont tordus tous du même côté (voir fig. 20).

Les parois du manubrium sont lisses, et contiennent les gonades que quatre bandes perradiales étroites séparent l'une de l'autre. Les 4 canaux radiés sont simples et étroits; le canal circulaire très petit.



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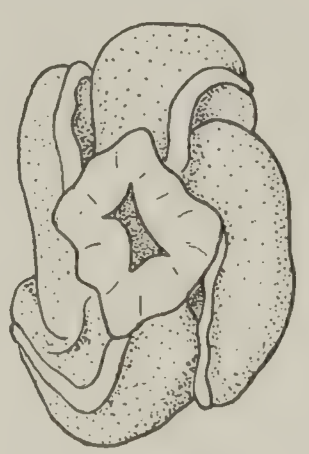

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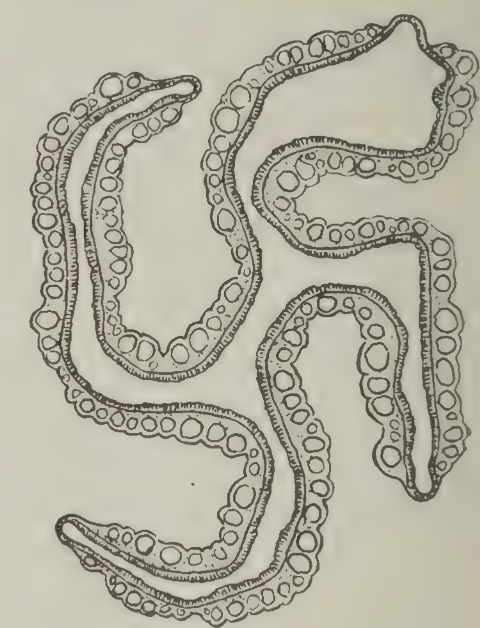


20.

Fig. 18—20. *Paratiara digitalis* n. g., n. sp. — Fig. 18. Vue latérale de la méduse. — Fig. 19. Vue orale du manubrium. — Fig. 20. Section transversale du manubrium d'un individu femelle.

Les 4 tentacules marginaux sont longs. Leur bulbe est conique et se prolonge par un éperon abaxial sur le bord de l'exombrelle. Le vélum est étroit.

Cette forme se distingue de *Protiara* Haeckel par la présence de mésentères et de *Merga* Hartlaub (1913, p. 249) par ses gonades qui sont contenues dans les plans interradiaux, ainsi que par le nombre des tentacules qui ne dépasse pas quatre.

Le genre nouveau *Paratiara* peut donc être défini de la manière suivante: Tiarides pourvus de gonades lisses interradiales; ouverture buccale à quatre lèvres simples; mésentères bien développés, 4 tentacules marginaux prolongés par des éperons abaxiaux.

Distribution:

Cette espèce appartient à la région arctique et a été pêchée à la surface.

18. *Tiaranna rotunda* (Quoy et Gaimard).

Matériel:

Date	Situation	Origine	Observations
1906 4.IX	Hjörundfjord	"M. S." stat. 392	dans la profondeur
— 5.IX	do.	— — 398	
— 29.XI	do.	—	
1916 4.VIII	Skarnsund, Trondhjem-fjord	Nordgaard col.	1 expl.

Un total de 17 exemplaires de cette méduse où nous retrouvons une espèce méditerranéenne décrite en 1827 par Quoy et

Fig. 21. *Tiaranna rotunda* (Quoy et Gaimard).

Gaimard, a été recueilli dans les pêches bathypélagiques exécutées par le "Michael Sars" en 1906 dans le Hjörundfjord.

Nous croyons utile de publier les notes qui ont été prises à bord immédiatement après la capture.

La cloche (fig. 21) de cette méduse atteint 10 à 15 mm de diamètre et de hauteur. La mésoglée, extrêmement épaisse, est fort consistante, la masse gélatineuse apicale est aussi haute que la cavité de la cloche elle-même.

L'estomac (fig. 22) forme une pyramide à quatre faces dont les angles sont bien marqués. La base de la pyramide répond aux franges buccales formant quatre lèvres et délimitant la bouche quadrangulaire.

La partie moyenne des faces latérales est dépourvue de produits génitaux qui sont développés le long des 4 arêtes qui sont formées par un epithelium mince par lequel se continuent les quatre canaux radiés. Sur le plafond de l'estomac ces quatre canaux se réunissent deux à deux.

L'estomac est soudé à la sous-ombrelle non seulement par son sommet, mais aussi le long des 4 arêtes. Aussi la cavité de la cloche est divisée dans la partie apicale en quatre poches péristomacales séparées par des "mésentères".

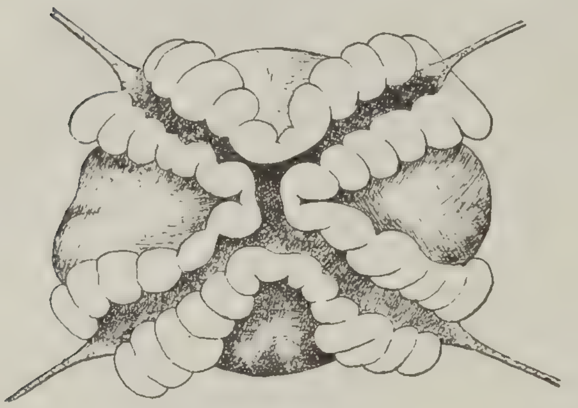


Fig. 22. *Tiaranna rotunda* (Quoy et Gaimard). Vue dorsale du manubrium avec des gonades plissés.

Les quatre canaux radiés sont étroits, aplatis. Le canal circulaire est élargi au niveau de chaque tentacule.

Ceux-ci sont en général au nombre de seize. Entre deux tentacules voisins on observe 2, 3, plus rarement 4 tentacules rudimentaires.

Le vélum est bien développé.

Totalement transparente dans sa mésoglée, cette méduse est rouge carmin virant au violet dans toutes les parties endodermiques. Cette couleur est surtout éclatante dans l'estomac et les bulbes tentaculaires. La mésoglée est envahie dans la région stomacale et le long des canaux radiés par des corps amoebiformes très particuliers.

Historique:

L'histoire de cette méduse est curieuse. Trouvée dans le détroit de Gibraltar (Quoy et Gaimard 1827, Haeckel 1879, Maas 1910), elle se rencontre dans la partie avoisinante de la Méditerranée où le "Michael Sars" au cours de l'expédition de 1910 en a capturé deux exemplaires (Kramp 1920).

D'autre part Hartlaub (1913, p. 266) en a signalé un jeune exemplaire recueilli dans la partie nord de la Mer du Nord.

Se basant sur les exemplaires méditerranéens du "Michael Sars" Kramp (1920, p. 6, pl. I fig. 2—4) a donné une nouvelle description de cette méduse et a attiré l'attention sur la ressemblance de structure qui existe entre les tentacules rudimentaires de *Tiaranna rotunda* et les cordyles de *Chromatonema rubrum*. Cette similitude est discutée d'une manière plus spéciale par Kramp (1919).

Aux exemplaires norvégiens du "Michael Sars" s'est ajouté recemment un autre échantillon complètement mûr de cette espèce intéressante. C'est un exemplaire mâle mesurant 22 mm de large sur 19 mm de haut capturé par O. Nordgaard à Skarnsund dans le fjord de Trondhjem le 4 août 1916. Ici, les gonades sont fort développées et par des plissements secondaires sont devenues un peu plus compliquées. L'intérêt spécial de cet échantillon réside dans son état de contraction. Le manubrium est si rétracté que les parties interradiales dépourvues de produits sexuels sont complètement cachées et que les gonades se touchent, de sorte que le manubrium entier est prismatique. Dans la description citée, Kramp dit que les parties de la paroi sous-ombrellaire qui confinent au $^{1}/_{3}$ proximal des canaux radiés "are dragged inwards into the bell cavity, forming four gelatinous projections". Ces soulèvements gélatineux de la sous-ombrelle sont par suite de la forte contraction de l'exemplaire du fjord de Trondhjem si saillants qu'ils se touchent presque l'un l'autre sous la bouche de l'animal. Le manubrium est pour ainsi dire retiré dans une niche presque complètement isolée du reste de la cavité de la cloche. Dans cet état de forte contraction l'animal ressemble parfaitement à *Rotundula brochii* de Hartlaub (1917, p. 411). Le nouveau genre de cette nouvelle espèce est créé pour recevoir un specimen du fjord de Trondhjem. Il avait conservé ses organes marginaux suffisamment intacts pour que leur description comme les autres caractères de l'animal portent immédiatement l'attention sur *Tiaranna rotunda.* Aussi nous n'hésitons pas à dire que *Rotundula brochii* Hartlaub est identique à *Tiaranna rotunda.*

On objectera peut-être que dans le spécimen de Hartlaub le manubrium présentait une structure bilatérale; mais nous pensons qu'il était ou défectueux ou anormal, car à tous les autres points de vue il répond aux nôtres. Hartlaub indique d'ailleurs (p. 414) que cet individu était attaqué par des parasites.

19. *Leuckartiara octona* (Fleming).
20. *Leuckartiara breviconis* (Murbach et Shearer).
21. *Neoturris pileata* (Forskål).

Ces trois espèces ont été longtemps confondues dans une même espèce, généralement connue sous le nom de *Tiara pileata.* Hartlaub a eu le mérite de débrouiller les nombreuses confusions aux-

quelles ont prêté ces formes capables de grandes variations. L'étude approfondie qu'il en a donnée dans le Nordisches Plankton (1914) a permis de soumettre le matériel conservé à une révision qui a prouvé que ces trois espèces, fréquentes à la côte norvégienne, peuvent s'y rencontrer en même temps et au même endroit. Ce fait ignoré au moment du travail de récolte nous oblige à ne pas utiliser les nombreuses citations du journal de bord signalant la présence de "*Tiara pileata*" dans les pêches pélagiques du "Michael Sars".

Dans la suite nous ne pouvons nous occuper que de la partie conservée du matériel, et par conséquent nous avons seulement fait la révision des déterminations d'espèces, laissant à part le reste des notes de notre journal.

Matériel;

Leuckartiara octona (Fleming).

No.	Date		Situation	Origine		Observations
1.	1903	30.VI	57° 42'—1° 08' E.	"M. S."	stat. 142	1 expl. 11 mm de hau
2.	1904	1.VII		—	— 260	7 expl. 8—11 mm
3.	1905	IX	Puddefjord	Stat. biol.		8 expl. 9—14 mm
4.	1906	28.VI	60° 38' N—2° 35' E.	"M. S."	stat. 291	4 expl. 6—14 mm
5.	—	10.-11.VII	Hjörundfjord	—	— 304	1 expl. 14 mm
6.	—	25.VIII	66° 25' N—8° 25' E.	—	— 368	1 expl. 10 mm
7.	—	31.VIII	67° 30' N—11° 00' E.	—	— 363	1 expl. 10 mm
8.	—	—	67° 08' N—12° 08' E.	—	— 384	1 expl.

Leuckartiara breviconis (Murbach et Shearer).

No.	Date		Situation	Origine		Observations
1.	1906	12.V	Samnangerfjord	"M. S."	stat. 179	2 expl. 10 mm de ha
2.	—	12.V	Björnefjord	—	— 181	6 expl. 5—10 mm
3.	—	23.V	60° 37' N—0° 23' O.	—	— 197	1 expl. 9 mm
4.	—	23.V	2 milles E.S.E. de Balta Sound, Shetland	—	— 198	1 expl. 5 mm
5.	—	10.-11.VII	Hjörundfjord	—	— 304	3 expl. 20—24 mm

Neoturris pileata (Forskål).

1.	1900	4.VIII	66° 28' N—25° 18' O.	"M. S."	stat. 14	13 expl.
2.	1903	30.VI	57° 42' N—1° 08' E.	—	— 142	3 expl. de 7 à 13 m
3.	1904	30.VII	56° 03' N—6° 05' E.	—	— 257	2 expl. de taille moy
4.	—	30.VI	56° 56' N—3° 49' E.	—	— 260	1 expl. id.
5.	—	6.VII	57° 09' N—1° 30' E.	—	— 275	1 expl. 13 mm

Date		Situation	Origine	Observations
904	6.VII	57° 08' N—2° 11' E.	"M. S." stat. 276	4 expl. 7 à 14 mm
905	25.V	62° 43' N—3° 42' E.	— — 30	1 expl. 8 mm
906	23.V	60° 37' N—0° 23' O.	— — 197	1 expl. 5 mm
—	28.VI	60° 38' N—2° 35' E.	— — 291	5 expl. 5 à 13 mm
—	10.-11.VII	Hjörundfjord	— — 304	3 expl. 20, 22, 31 mm
—	14.VIII	60° 45' N—3° 50' E.	— — 336	7 expl. 5—20 mm
—	23.VIII	64° 00' N—5° 40' E.	— — 364	1 expl. 32 mm

Leuckartiara octona est une espèce fort répandue. A la côte orientale de l'Amérique elle est une forme septentrionale. Elle est assez commune dans la Méditerranée et appartient aux méduses les plus fréquentes aux côtes de l'Europe du Nord, où elle range depuis La Manche jusqu'à l'Islande et aux Lofoden. L'hydroïde *(Perigonimus repens)* est une forme littorale, mais la méduse a une si longue vie qu'elle est parfois emmenée par le courant assez loin de sa place d'origine et retrouvée à grande distance des côtes.

Leuckartiara octona est une forme norvégienne anciennement connue. La description précise et les figures caractéristiques de Michael Sars permettent de la reconnaître dans la méduse qu'il décrivit dès 1835 sous le nom d'*Oceania ampullacea*. De même, Ehrenberg en 1836 l'a représentée et figurée d'après un exemplaire provenant de Dröbak *(Oceania pileata)*. Forme commune dans les eaux superficielles, elle a été fréquemment observée. La présence de *Leuckartiara octona* a été signalée dans le fjord de Christiania, en août et septembre (Asl. Sverdrup 1921, p. 21); dans le Söndeledfjord, en mai (Broch 1905, p. 4); à Mandal, en août; au large de Stavanger, en fin novembre (Hartlaub 1914, p. 291); à Indrö (Broch 1905); près de Bergen, en août et novembre (Browne 1903, p. 11, Broch 1905 et obs. 3); enfin au sud du Cap Stat à Kalvaag, en juin (Broch 1905). Elle est donc commune et très généralement répandue dans les fjords du sud et la section méridionale de la côte occidentale. Nous la retrouvons dans les fjords du Romsdal (obs. 5); et sa limite septentrionale peut être reportée aujourd'hui au moins jusqu'aux Lofoden; car, elle a été rencontrée au large jusque dans le Vestfjord (obs. 6, 7 et 8). Ainsi se trouve réalisée la prévision émise par Hartlaub (1914, p. 303), en se basant sur la distribution de l'hydroïde *Perigonimus repens*. La méduse paraît en juin et demeure dans le plankton au moins jusqu'à novembre.

Leuckartiara breviconis (Murbach et Shearer), forme qui atteint une taille beaucoup plus considérable (jusqu'à 24 mm de hauteur), a été décrite en premier lieu d'après des exemplaires provenant de l'Alaska. Hartlaub l'a reconnue dans des spécimens capturés par le vapeur "Poseidon" dans le nord de la Mer du Nord. Malheureusement il lui a donné par faute d'écriture le nom d'espèce de *brevicornis*, tandis que le nom sous lequel elle a été décrite par Murbach et Shearer est *breviconis*, nom ayant rapport à la courte projection apicale. Le "Michael Sars" l'a retrouvée près des îles Shetland. Grâce à l'examen du matériel conservé, il est aujourd'hui possible de démontrer que *Leuckartiara breviconis* se rencontre également à la côte norvégienne de mai à juillet. Elle y est probablement commune.

Des individus d'assez petite taille ayant été trouvés en mai aux fjords près de Bergen (obs. 1 et 2) il est à supposer que la méduse soit originaire des fjords. En juin des exemplaires adultes ont été recueillis à Hjörundfjord près d'Aalesund (obs. 5). Jusqu'ici elle n'a pas été constatée en des localités plus septentrionales, et la région de sa distribution paraît après tout plus méridionale que celle des deux autres espèces.

Neoturris pileata (Forskål) se trouve dans la Méditerranée, mais dans la région de l'Europe du Nord sa distribution est généralement un peu plus septentrionale que celle de *Leuckartiara octona*, et d'un caractère beaucoup plus océanique.

Cette espèce est représentée dans les collections du "Michael Sars" par une trentaine d'individus de tailles différentes. Presque tous proviennent de stations en pleine mer, soit de l'ouest de l'Islande (obs. 1) soit de la Mer du Nord (obs. 2, 3, 4, 5, 6). Les observations 9 et 12 nous la montrent au delà de la descente continentale. Sa présence dans les fjords norvégiens est documentée par l'observation 10 qui s'ajoute à une constatation faite antérieurement par Browne. Car, si la plupart des méduses qu'il signale sous le nom *Tiara pileata* appartiennent à l'espèce *Leuckartiara octona*, l'exemplaire provenant du Herlöfjord et capturé à la date du 3 décembre 1900 est indubitablement une *Neoturris pileata*.

De jeunes exemplaires paraissent surtout en mai à juin mais

sont pourtant à constater encore en août. Nous avons des individus adultes parmi nos matériaux de juillet et d'août; mais ils peuvent se tenir dans les fjords jusqu'en décembre.

22. *Catablema vesicarium* A. Agassiz.

Matériel:

Date		Situation	Origine	Observations
900	5.VIII	66° 45' N—15° 36' O.	"M. S." stat. 15	7 expl. 14 à 22 mm de haut.
—	4.IX	74° 07' N—19° 04' E.	— — 61	6 expl. 14—22 mm
901	26.VII	Green Harbour, Spitzbergen	—	3 expl. de taille moyenne
909	22.VI	69° 38' N—19° 45' E.	— — 125	1 expl. 28 mm
—	—	69° 45' N—19° 45' E.	— — 127	1 expl. 15 mm
—	—	69° 51' N—19° 46' E.	— — 129	1 expl. 25 mm

Catablema vesicarium est une espèce franchement arctique commune sur les côtes du Labrador et qui descent rarement au sud du cap Cod, à la côte américaine (Mayer 1910). On la rencontre au Grönland, à la côte nord de l'Islande (obs. 1) au Spitzbergen (obs. 3) autour de l'île aux Ours (obs. 2), ainsi que dans la Mer de Barentz et la Mer Blanche.

Un intérêt particulier s'attache aux observations 4, 5 et 6 qui démontrent sa présence à la côte des Vesteraalen. Ces constatations permettent de fixer la limite méridionale de cette espèce.

23. *Bythotiara murrayi* Günther.

Matériel:

Date		Situation	Origine	Observations
906	5.VII	Hjörundfjord	"M. S." stat. 248	dans la profondeur, 1 expl.
907	30.VII	Herlöfjord	Stat. biol.	id. 5 expl.

Les expéditions océanographiques récentes ont fait connaître un type très spécial de méduses apparentées aux Tiarides pour lequel on a proposé la création d'une famille spéciale, les Calycopsides. Elle comprend les genres *Bythotiara*, *Calycopsis*, *Sibogita* etc.

Ces méduses paraissent appartenir à la faune bathypélagique et comme telles jouissent d'une distribution géographique étendue.

L'espèce *Bythotiara murrayi* décrite par Günther (1903) d'après un exemplaire incomplet pêché au sud ouest de l'Irlande à l'aide d'un filet descendu à 1610 brasses, a été retrouvée en plusieurs points de l'Atlantique et de la Méditerranée par le Prince de Monaco et Krupp (Maas 1904 et 1910) ainsi qu'à l'embouchure du Congo et à la côte occidentale du Sumatra par la "Valdivia" (Vanhöffen 1910).

Sa présence dans les parages de la Norvège avait été signalée par Hartlaub (1914, p. 356). Un exemplaire a été pêché par le "Poseidon", le 22 février 1903, dans la Fosse Norvégienne, au large de Lindesnaes.

Nos recherches ont prouvé que cette méduse bathypélagique fait partie de la faune profonde des fjords norvégiens, où elle accompagne d'autres formes atlantiques telles que *Periphylla hyacinthina.* Nous aurons l'occasion de citer d'autres exemples de ce fait géographique intéressant que nous discuterons dans la partie générale.

La hauteur de cloche de la méduse monte jusqu'à 20 mm. Les exemplaires provenant de Herlöfjord sont des dimensions suivantes: 6, 8, 8, 11 et 14 mm de hauteur; ils sont tous de construction régulière, à 8 canaux radiaires, tous s'ouvrant dans le canal circulaire; les petits individus ne se distinguent en aucun rapport des plus grands.

24. *Calycopsis simplex* n. sp.

Matériel:

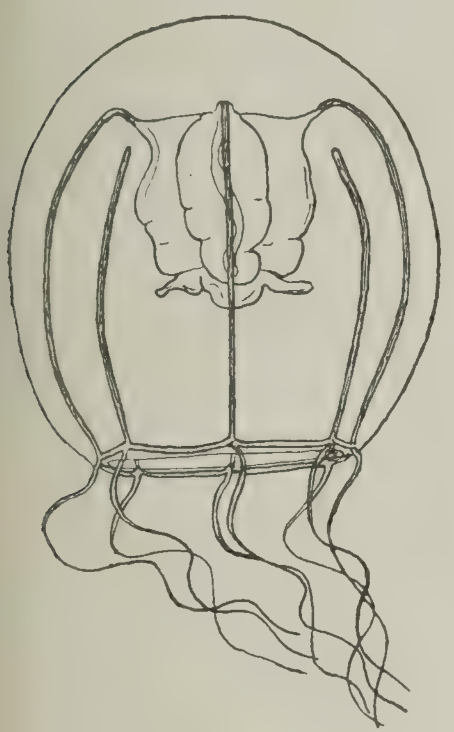
No.	Date	Situation	Origine	Observations
1.	1906 5.VI	Hjörundfjord	"M. S." stat. 248	dans la profondeur,

Les mêmes pêches bathypélagiques exécutées dans le Hjörundfjord qui ont fourni le premier exemplaire de *Bythotiara murrayi,* ont également procuré un spécimen d'une *Calycopsis.* Il a été dessiné peu après la capture. Les figures 23—25 sont des copies des esquisses originales.

Description:

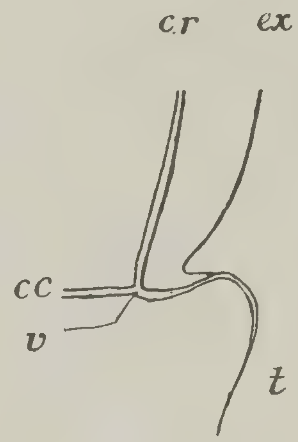
L'ombrelle (fig. 23) mesure environ 8 mm de hauteur et de largeur. La mésoglée assez mince sur les côtés de la cloche,

s'épaissit au sommet qui est régulièrement arrondi. Le manubrium est large et à peu près aussi long que la moitié de la cavité de la cloche. Il possède quatre lèvres perradiales simples. Les quatre gonades interradiales couvrent complètement la paroi stomacale depuis la base jusqu'aux lèvres buccales, ne laissant libres que quatre étroites bandes perradiales. Ces gonades sont longitudinalement plissées, formant quatre profonds sillons interradiaux (fig. 24) et portent d'ailleurs dans la moitié distale deux ou trois plis transversaux irréguliers. La base de l'estomac est en forme de croix, mais il n'y a pas de mésentère proprement dit. Les quatre canaux



23

24



25

Fig. 23—25. *Calycopsis simplex* n. sp. — Fig. 23. Vue latérale. — Fig. 24. Vue aborale. — Fig. 25. Issue d'un tentacule. *c. c.* canal circulaire; *c. r.* canal radiaire; *ex.* exombrelle; *t.* tentacule; *v.* velum.

radiaires sont étroits et simples. Le canal circulaire est étroit. Il s'en détache quatre canaux interradiaires centripèdes qui s'arrêtent à quelque distance de la base de l'estomac. Huit longs tentacules répondent à ces huit canaux. A la base de chaque tentacule l'exombrelle est étirée en une prolongation conique contre laquelle la portion basale du tentacule est soudée (fig. 25). Il n'y a pas de bulbe tentaculaire et il ne nous est pas possible, vu l'état de conservation de l'individu, de dire si les tentacules se terminaient par un bouton. Au dessus du canal circulaire, chaque octant porte une petite éminence gélatineuse saillant du côté exombrellaire. Le vélum étroit est bien développé.

L'exemplaire capturé est mâle.

Discussion spécifique:

Le genre *Calycopsis* est encore mal connu, parce que jusqu'à présent il n'a été recolté qu'un nombre restreint d'individus, capturés dans des régions très éloignées les unes des autres. Aussi, on est peu renseigné sur les variations des diverses espèces. Bigelow (1918, p. 377 et 1919, p. 289) en a donné une révision.

L'échantillon norvégien n'était peut-être pas encore complètement développé. Cependant d'après l'état des gonades mâles, il ne devait pas être fort éloigné de la maturité sexuelle. Le faible plissement de ces gonades est un caractère que notre forme a en commun avec *C. borchgrevinkii* (Browne 1910, p. 17). Au total, notre espèce a une grande ressemblance avec cette forme antarctique, surtout avec le jeune stade figuré par Vanhöffen (1911, Taf. XXII, fig. 7); mais il s'en distingue par sa gelée plus mince et par l'absence de mésentères.

Une seule autre espèce de *Calycopsis* est dépourvue de mésentères: *C. valdiviae* Hartlaub (= *C. typa* Vanhöffen 1911, p. 214, Taf. XXII, fig. 6). Mais cette dernière est une espèce de taille beaucoup plus considérable, elle possède 24 tentacules et un nombre élevé de canaux radiés (circa 60).

On peut se demander si *Calycopsis typa* (Vanhöffen 1912, p. 364) capturée par l'expédition antarctique est un stade jeune de *C. valdiviae* ou si elle représente une variété locale de *C. typa* Fewkes. Ce qui nous intéresse surtout c'est qu'elle possède les mêmes soulèvements de la gélatine exombrellaire au bord de la cloche que nous avons reconnus dans la forme norvégienne. L'exemplaire de *C. valdiviae* en présente d'ailleurs de traces.

Ces soulèvements sont encore plus développés et pourvus de papilles chez *C. papillata* Bigelow (1918, p. 378, Pl. 2 fig. 1 à 7 et Pl. 3 fig. 1), dont notre exemplaire possède la plupart des caractères distinctifs à un degré atténué. Des différences importantes nous empêchent cependant de le considérer comme un individu jeune de cette espèce. Comparons le, en effet, avec le plus petit des exemplaires décrits de *C. papillata*. Ce dernier mesure 11 mm de hauteur et de largeur. Tout d'abord les gonades y sont moins développées que chez l'individu norvégien, mais arrangées nettement en rangées verticales. Mais surtout, le jeune *C. papillata* possède 2 canaux centripèdes dans chaque quadrant. Les canaux

centripèdes de la forme norvégienne sont interradiaux. Si donc elle développait dans les stades ultérieurs des canaux supplémentaires, ceux-ci auraient une disposition tout autre. Nous n'ajouterons que pour mémoire la présence chez *C. papillata* adulte de mésentères. Dans les jeunes spécimens, ils sont aussi faiblement développés que dans la forme de Norvège.

Celle-ci se distingue, enfin, de *Calycopsis typa* Fewkes, entre autres caractères, par l'absence de la dépression apicale caractéristique.

Nous voyons par conséquent, qu'il n'est pas possible de rapporter parfaitement notre *Calycopsis* norvégienne à aucune espèce décrite, quoiqu'elle présente une grande ressemblance avec plusieurs d'entre elles, surtout avec *C. papillata* Bigelow et *C. borchgrevinkii* Browne. Nous pensons qu'il convient de la considérer dans l'état actuel de nos connaissances comme représentant une espèce nouvelle et nous proposons de la nommer *Calycopsis simplex*, en raison du petit nombre de ses canaux centripèdes, de la brièveté de ses mésentères, et du faible développement de ses saillies intertentaculaires.

Distribution géographique.

Les *Calycopsis* actuellement connues proviennent de régions très éloignées: Océan atlantique, Pacifique, Océan indien, mers antarctiques et arctiques. Aucune n'avait été signalée dans les eaux européennes. La présence de ce genre cosmopolite dans les fjords de Norvège est donc un fait géographique intéressant. On y verra un exemple de la ressemblance des faunes bathypélagiques.

Notre exemplaire provient de l'un des fjords profonds de la côte occidentale et il a été capturé par un filet traînant à plus de 400 m de profondeur. Nul doute qu'il n'appartienne à la faune profonde. C'est un caractère qu'il a en commun avec les autres *Calycopsis*. Le fait que dans les mers polaires, certaines *Calycopsis* remontent à la surface, tandis que, dans les mers tempérées et chaudes, elles se tiennent dans la profondeur, est un exemple d'une règle fort générale de la distribution des organismes pélagiques.

25. *Willsia stellata* Forbes.

Matériel:

No.	Date	Situation	Origine	Observations
1.	1907 28.VIII	Hjeltefjord	Stat. biol.	1 expl., $2^1/_2$ mm de
2.	1908 13.X	Puddefjord	— —	1 expl. $2^1/_2$ mm
3.	— 21.X	do.	— —	1 expl., 3 mm
4.	— 5.XI	Solsvik	— —	1 expl.
5.	— 29.XI	Solsvik	— —	3 expl., $2^1/_2$ à 3 m

Willsia stellata n'a pas jusqu'à présent été signalé à la côte de Norvège. Nous n'en avons nous-mêmes capturé qu'un petit nombre de spécimens. La raison n'en est peut-être pas dans sa rareté absolue, mais plutôt dans le fait que son apparition est tardive. A l'arrière-saison, nous n'avons pas eu l'occasion de faire de nombreuses pêches pélagiques, de sorte que nos observations se limitent à quelques essais exécutés lors des excursions organisées par la station biologique dans la région de Bergen. Nous sommes donc dans l'impossibilité de déterminer son extension géographique vers le nord.

Remarquons seulement la date relativement tardive à laquelle elle se montre, fin août à novembre, qui marque un retard important sur l'apparition de la même espèce dans les régions de La Manche qui constituent son domaine principal. Retenons, aussi, le fait que nos individus sont tous de taille petite et qu'ils ont les six canaux radiés simplement bifurqués, c'est à dire se trouvent au stade 2 de la description de Browne (1897, p. 818). Il semble donc que l'espèce n'atteint ni la taille ni le développement qu'elle prend dans les mers du sud.

Leptomedusae.

26. *Laodicea undulata* (Forbes et Goodsir).

Matériel:

No.	Date	Situation	Origine	Observations
1.	1902 13.VIII	60° 55' N — 8° 56' O.	"M. S." stat. 78	2 expl. diam. 14 à 2
2.	— 15.VIII	61° 09' N — 7° 56' O.	— — 82	2 expl. 25 mm
3.	1906 22.V	60° 40' N — 2° 23' E.	— — 194	26 expl. 10—25 mm
4.	-- 22.V	60° 39' N — 1° 25' E.	— — 195	27 expl. 12—33 mm d ind. à 5 rayons

Date	Situation	Origine	Observations
06 23.V	60° 37' N—0° 23' O.	"M. S." stat. 197	2 expl. 28 et 31 mm
- 23.V	2 milles ESE de Balta Sound, Shetland	— — 198	2 expl. 11 mm
- 28.V	Björnsund-Galdreskaer	— — 208	1 expl. 17 mm
- 18.VI	62° 51' N—5° 57' E.	— — 271	4 expl. 24—30 mm
- 1.VII	Haröfjord	—	1 expl. 19 mm
- 14.VIII	60° 42' N—3° 08' E.	— — 337	1 expl. 15 mm
- 16.VIII	61° 12' N – 0° 50' E.	— — 350	1 expl. 29 mm
- 17.VIII	61° 45' N—2° 42' E.	— — 353	2 expl. 17 et 18 mm
- 18.VIII	63° 25' N—4° 24' E.	— — 359	1 expl. 24 mm
- 23.VIII	64° 00' N—5° 40' E.	— — 364	1 expl. 20 mm
- 23.VIII	64° 50' N—4° 00' E.	— — 365	1 expl. 33 mm
- 29.VIII	69° 36' N—16° 39' E.	— — 379	1 expl. 24 mm
- 30.VIII	Embouchure de Hadselfjord	— — 380	3 expl. 20, 23 et 36 mm
xtraits du journal du "Michael Sars":			
06 2.IV	63° 00' N—6° 30' E.	"M. S." stat. 78	
- 17.IV	60° 38' N – 0° 44' E.	— — 95	
- 30.V	Hessefjord	— — 223	
- 30.V	Entre Vaeringsaet et Hareid	— — 224	
7.VI	Hjörundfjord	— — 247	
31.VII	67° 30' N—11° 00' E.	— — 383	
4.IX	Hjörundfjord	— — 392	

Remarques biologiques:

Cette méduse est très répandue. Elle est fort commune pendant tout l'été dans la région nord-atlantique depuis le canal de la Manche jusqu'au sud de l'Islande.

On n'en connaît qu'une seule capture à la côte norvégienne. Hartlaub (1900, p. 172) la signale dans le compte-rendu du voyage du bateau "Olga" à propos des exemplaires recueillis à la fin du mois de juin à Tromsö. Kramp (1919, p. 29) avait cru devoir souligner cette trouvaille isolée et peut-être douteuse, car l'espèce n'était pas connue dans la Mer Norvégienne. La constatation que *Loadicea undulata* est, au contraire, une forme très commune tout le long de la côte de Norvège est donc un fait nouveau et très intéressant.

Elle apparaît dès le mois d'avril. A cette époque, on rencontre de jeunes individus, chez lesquels les produits génitaux sont à peine indiqués. Dès la seconde moitié du mois, certains specimens atteignent une taille de 25 à 33 mm. Cette méduse persiste dans

le plankton pendant tout le printemps et se maintient jusqu'à la fin du mois d'août, époque à laquelle elle devient rare. Les exemplaires recueillis alors sont généralement épuisés. Leurs gonades sont vidées.

Distribution géographique:

L'hydroïde, une espèce de *Cuspidella*, est une forme littorale. Les jeunes *Laodicea undulata* se rencontrent donc près de terre, mais leur existence pélagique prolongée les livre aux courants marins, aussi trouve-t-on cette méduse dans un domaine très étendu.

Dans la Mer du Nord, huit captures prouvent que *Laodicea undulata* est fréquente dans les parages des Shetlands, ainsi qu'au dessus de la partie profonde du plateau. Elle dépasse même la côte de 200 m de profondeur qui constitue normalement la limite de l'extension du plankton néritique. Au sud des îles Féroé, le "Michael Sars" a recueilli des exemplaires isolés.

A la côte norvégienne, elle est très fréquente dans les eaux intermédiaires des fjords profonds. Nous l'avons aussi capturée sur le banc de Romsdal et près des Lofoden. Sa dérive au large de la côte est prouvée par plusieurs captures faites au dehors de la descente continentale. Ces individus sont toujours isolés et ces captures sporadiques. Il est naturel, en effet, que ces émigrants de la côte soient dispersés et comme perdus dans les eaux du large. Ils ne sont que plus intéressants, car ils indiquent l'étendue des migrations qu'accomplissent passivement certaines méduses côtières.

27. *Staurophora mertensii* Brandt.

Matériel:

No.	Date		Situation	Origine		Observations
*1.	1900	24.VIII	Porsangerfjord	"M. S."	stat. 52	
*2.	1904	20.VI	63° 25' N—5° 38' E.	—	— 272	
*3.	—	25.VII	67° 27' N—13° 15' E.	—	— 322	
*4.	1906	17.IV	60° 40' N—2° 29' E., surface	—	— 93	
*5.	—	24.IV	Vartdalsfjord, 125—0 m	—	— 123	
6.	—	25.IV	Giskö—Haramsö, surface	—	— 130	1 expl., diam. 10 m
*7.	—	26.IV	Finö—Synaes, 30—0 m	—	— 131	

Date		Situation	Origine		Observations
1906	26.IV	Björnebaaen—Karlsbaaen, 55—0 m	"M. S."	stat. 134	
—	21.V	Feje	—	— 190	
—	23.V	60° 37' N – 0° 23' O.	—	— 197	
—	27.V	Aspevaagen	—	— 206	
—	28.V	Haröfjord, 75—0 m	—	— 207	4 expl., diam. 2,5—4 cm
—	—	Björnsund—Galdreskaer	—	— 208	
—	—	63° 21' N—6° 14' E.	—	— 211	
—	30.V	Hessefjord	—	— 223	
—	—	Vaeringsaet—Hareid	—	— 224	
—	7.VI	Hjörundfjord	—	— 247	
—	11.VI	Storfjord	—	— 253	
—	23.VIII	64° 50' N—4° 00' E.	—	— 365	
—	29.VIII	69° 36' N—16° 39' E.	—	— 379	
—	31.VIII	67° 30' N – 11° 00' E.	—	— 383	
—	5.XI	Hjörundfjord	—	— 392	
1909	15.VI	Skutvik—Taenholmsnaes	—	— 87	1 expl.
—	16.VI	Hekkingen—Edö	—	— 92	
—	22.VI	69° 45' N—19° 45' E.	—	— 127	1 expl., diam. 13 mm

Distribution:

Cette grande méduse a sa distribution principale dans les régions arctiques, pacifiques aussi bien qu'atlantiques. Elle apparaît toutefois aussi dans les régions subarctiques et boréales, ayant été signalée de la partie septentrionale de la Mer du Nord, et Hartlaub (1897, p. 484) ayant trouvé de jeunes exemplaires à Helgoland.

A la côte de Norvège elle a été constatée par M. Sars depuis le Finmark jusqu'à Christianssund (M. Sars 1851, p. 158, *Oceania multicirrata;* 1863, p. 339, *Staurophora vitrea).* Broch (1905, p. 7) pense avoir trouvé de jeunes exemplaires à Puddefjord au mois d'août. La plus grande des Leptoméduses du nord a été observée comme une des formes les plus caractéristiques dès la première croisière du "Michael Sars" en 1900. La forme en croix de ses gonades et de son manubrium, sa couleur laiteuse, sa taille ont attiré de suite l'attention, et bien que dans les collections elle ne soit représentée que par un petit nombre d'exemplaires, surtout de petites dimensions, nous pouvons fournir à son sujet des renseignements assez complets en utilisant des notes de valeur incontestable du journal.

Elle apparaît au printemps dès la première moitié d'avril et les

individus mènent vraisemblablement une vie pélagique prolongée, car leur croissance est longue. L'espèce maintient jusqu'au début de septembre, elle a donc le temps d'accomplir des migrations importantes.

C'est ce que démontre l'examen de la liste publiée. En effet à côté de nombreuses observations faites dans les fjords, depuis Bergen jusqu'au cap Nord (Porsangerfjord), nous la trouvons en pleine mer à l'est des îles Shetland, à travers le banc de Romsdal et à l'ouest et au nord des Lofoden.

28. *Ptychogena crocea* n. sp.

(Planche I, fig. 1—7).

Matériel:

1906. 22. juin. Moldefjord, à la profondeur.

Description:

Cloche aussi haute que large, plus que hémisphérique. Gelée épaisse, surtout au sommet, diminue régulièrement vers les bords.

L'estomac (fig. 1) comprend deux parties: 1) portion stomacale s. str. de forme pyramidale quadrangulaire excavée vers le sommet. Elle touche la gelée de la cloche par une insertion cruciforme (fig. 2). Les côtés sont pourvus d'un certain nombre de plis longitudinaux irréguliers. 2) La partie buccale est en coupe en forme de croix. Le tube buccal un peu rétréci, comparé à la partie distale de l'estomac. Le bord buccal est faiblement plissé et étiré en 4 lèvres perradiales courtes (fig. 1). La bouche est susceptible de s'étirer et de s'étaler estimement. — Longueur du manubrium $^1/_2$—$^2/_3$ de la hauteur de la cavité sous-ombrellaire.

De la partie supérieure des bords perradiaux de l'estomac proviennent les quatre canaux radiaires. $^1/_3$—$^1/_2$ de leur partie distale est égal, fort étroit et circulaire en section de travers. La partie proximale est haute et comprimée, presque triangulaire, s'ouvrant aux angles perradiaux de l'estomac en une fissure verticale (voir fig. 3) qui est de chaque côté limitée par un pli saillant. Ces plis en se contractant servent à complètement isoler la cavité du canal radiaire de la cavité stomacale. Les parois de la partie ventrale du canal radiaire sont minces et dépourvues de gonades; la partie dorsale contient les gonades et se prolonge dans un nombre de

lamelles latérales (6—7 de chaque côté), placées à angle droit du canal radiaire et de la sous-ombrelle. Ces lamelles sont libres, attachées à la sous-ombrelle seulement à leur partie proximale près de la ligne du milieu du canal radiaire. Les produits sexuels remplissent tout l'ectoderme de cette partie plissée, sans interruption ni aux bords des lamelles ni dans les incisions intermédiaires. Il y a ainsi seulement 2 gonades à chaque canal radiaire, une de chaque côté, séparées dorsalement par la ligne d'attachement à la sous-ombrelle, ventralement par la partie du canal à parois minces et dépourvue de gonades. La cavité de la partie ventrale à parois minces n'est pas séparée de l'espace entre les gonades par deux plis longitudinaux latéraux comme chez *Laodicea undulata* et *Ptychogena lactea* (voir Kramp 1919). — L'étroite partie distale des canaux radiaires s'ouvre dans un canal circulaire étroit.

Tentacules nombreux, assez courts, pourvus de bulbes basales élonguées assez comprimées qui sont courbées de manière à rendre le bord abaxial un peu convexe. La bulbe se rétrécie assez subitement jusqu'à former un tentacule filiforme qui peut s'enrouler en spirale. A la base de la bulbe tentaculaire il y a une faible indication d'un éperon abaxial, le plus visible à la section (fig. 4) d'où il appert que les cellules de l'endoderme de cet éperon sont fort vacuolisées mais remplies de protoplasme dans le reste de la bulbe tentaculaire ainsi que dans le canal circulaire. L'ectoderme est comme l'endoderme un peu plus épais du côté adaxial de la bulbe que du côté abaxial. Chez un individu de 25 mm de diamètre il y a environ 64 tentacules.

Entre les tentacules 2—4 cordyles. Chaque cordyle situé sur un tubercule plus ou moins grand. A fig. 5 (presque au milieu) se voit un cordyle au bout distal d'un tentacule poussant. Cordylus (fig. 6—7) est fusiforme ou un peu claviforme, pourvu d'une tige mince, attachée au tubercule marginal par un petit pied élargi en forme de plaque. La partie épaisse du cordyle a une cavité spacieuse en communication avec le canal circulaire par un canal fin à travers la tige. L'endoderme consiste en une seule couche formée de cellules cubiques, l'ectoderme est un épithélium mince en plaques Au bout distal l'ectoderme est assez épaissi et contient quelques nématocystes, ca. 10—20. Point d'ocelles.

Vélum grand et fort bien développé.

Couleur: estomac et organes génitaux safrans, tentacules rosés.

Taille: Recueilli individus depuis 10 mm jusqu'à 25 mm.

Discussion systématique:

Cette belle méduse est intéressante par sa position systématique, occupant une place inférieure en dedans du genre *Ptychogena* et montrant en certains rapports une tendance vers *Laodicea.*

Les tentacules, aux bulbes bien développées, au bord convexe, et dépourvus d'ocelles sont du même type que celui des autres espèces de *Ptychogena.* Quant à la forme ils s'accordent parfaitement avec les tentacules de *Pt. lactea* Ag., représentant le plus hautement développé du genre; même l'éperon rudimentaire se trouve chez les deux espèces. Les cordyles sont à un degré de développement inférieur à celui des cordyles de *Pt. lactea.* Chez celui-ci les cordyles sont en forme de massue plus prononcée, la cavité centrale est le plus souvent oblitérée dans la tige mince, et les nématocystes faisant défaut. Les cordyles de notre espèce s'accordent mieux avec ceux de *Pt. antarctica* Browne (1910, p, 29), Browne ayant trouvé des nématocystes dans quelques-uns des cordyles de cette espèce. Les organes marginaux de notre espèce semblent ressembler beaucoup à celles de *Pt. californica* Torrey (1909, p. 13), les cordyles de cette dernière espèce toutefois étant dépourvus de nématocystes.

Quant au système gastro-génital notre espèce se distingue nettement de *Ptychogena lactea,* le type du genre. Chez celui-ci les gonades sont étirées en de longues lamelles comprimées, dont le bord dorsal est attaché dans toute sa longueur à la sous-ombrelle, et la partie ventrale, sans gonades, du canal radiaire est par deux plis longitudinaux latéraux distinctement séparée de la partie gonadiale et s'ouvre en entonnoir dans les parois de l'estomac. Chez *Ptychogena antarctica* qui semble du reste se rapprocher de *Pt. lactea,* les plis latéraux des gonades sont courts et libres comme chez notre espèce, mais beaucoup plus nombreux. Chez *Ptychogena californica,* qui est, à tout prendre, en relation proche avec notre espèce, les plis des gonades sont également courts mais tout de même attachés à la sous-ombrelle. Notre espèce se distingue tant du type du genre qu'on pourrait être tenté à l'établir comme un

nouveau genre, mais, comme nous l'avons vu, il est, en ce qui se rapporte au système gastro-génital, attaché au type par des transitions successives à travers *Pt. californica* et *antarctica*, et les organes marginaux sont d'un type s'accordant parfaitement avec celui des autres espèces. Il n'est donc pas possible de la séparer du genre *Ptychogena*, mais elle appartient à une nouvelle espèce en dedans de celui-là.

Les caractères en lesquels elle se distingue de *Ptychogena* typique (les diverticles des gonades courtes et libres) indiquent le genre *Laodicea*. Chez celui-ci les gonades sont pourvues de courtes ondulations libres, qui sont pourtant, même chez *L. undulata*, l'espèce le plus hautement développée, encore plus courtes que chez notre espèce. Ce qui est de beaucoup d'intérêt c'est que nous trouvons chez *Laodicea undulata* comme chez *Ptychogena lactea* deux plis longitudinaux latéraux séparant le canal radiaire en une partie dorsale gonadiale et une ventrale aux parois minces, caractère qui fait défaut chez les espèces inférieures des deux genres. Nous avons donc ici en deux genres de relation rapprochée un cas de développement convergeant. En ce qui concerne le système gastro-génital il y a, comme nous l'avons vu, une connexion proche entre les genres *Ptychogena* et *Laodicea;* les tentacules sont toutefois de deux types complètement divergeants, chez *Laodicea* manquant les bulbes basales qui sont, au contraire, bien développées et d'un type definé chez toutes les espèces de *Ptychogena*. De plus toutes les espèces de *Laodicea* sont pourvues d'ocelles à la base des tentacules (en tout cas à un certain nombre de ceux-ci) tandis que chez *Ptychogena* les ocelles font absolument défaut.

Une espèce occupant une position encore plus inférieure que celle de notre espèce nouvelle, si après tout elle appartient au genre *Ptychogena*, c'est *Ptychogena aurea* Vanhöffen (1912, p. 366, Taf. I, fig. 4). Elle a les gonades pourvues de courtes renflements latéraux, et il y a aussi des bulbes tentaculaires bien développées; ni ocelles ni cordyles n'ont été observés. Toutefois la "description" de l'espèce comme plusieurs des diagnoses de Vanhöffen est si peu satisfaisante qu'il est impossible de déterminer avec sûreté la place systématique de l'espèce.

29. *Melicertum octocostatum* (M. Sars).

Matériel:

No.	Date		Situation	Origine	Observations
* 1.	1905	sept.	Puddefjord	Stat. biol. Bergen	
2.	1906	12.V	Björnefjord	"M. S." stat. 181	1 expl., diam. 8 mm
3.	—	22.VI	Romsdalsfjord		1 expl., diam. 8 mm
4.	—	10.VII	Hjörundfjord	"M. S." stat. 304	2 expl., diam. 6 mm
5.	—	12.VII	60° 50' N—4° 47' E.	— — 307	3 expl., diam. 6 mm
6.	—	30.VIII	68° 28' N—14° 25' E.	— — 380	4 expl., diam. ca. 12 mm
7.	1907	29.X	Hjeltefjord	Stat. biol. Bergen	1 expl., diam. 7 mm
8.	—	6.XII	Mofjord, 15 m, au dessous de la glace	— —	33 expl., diam. 3—6 mm
* 9.	1908	26.IV	Puddefjord	— —	fort jeunes expl. à 4 cana radiaires
*10.	—	12.V	—	— —	fort jeunes expl. à 4 cana radiaires
*11.	—	20.V	—	— —	fort jeunes expl. à 4 cana radiaires
12.	—	23.VI	Entre Klosternaes et Huglen	"M. S." stat. 79	4 jeunes expl.
13.	—	4.VII	Hodne—Espholm, Mastrafjord	— — 121	30 expl., diam. 3—6 mm
*14.	—	17.VII	Saevig, Lyngdalsfjord	— — 160	
*15.	—	22.VII	Bastelid, Jossefjord	— — 168	
*16.	—	29.VII	Christianiafjord	— — 193	
17.	—	octbr.	Herlöfjord	Stat. biol.	1 expl., diam. $2^1/_2$ mm
18.	—	25.X	Nordaasvand	—	nombreux expl., diam. $3^1/_2$— mm

Identification:

Il était naturel que nous rencontrions souvent cette espèce que Michael Sars a le premier décrite et figurée d'une manière parfaitement reconnaissable. Nous ne reviendrons pas sur la discussion générique qui a été soulevée par la distinction faite par Haecke entre *Melicertum* et *Melicertidium*. Haeckel induit en erreur par la figure d'Ehrenberg, a attribué à la méduse norvégienne des masses marginales. Bornons-nous à confirmer que celles-ci n'existent pas. Une circonstance explique peut-être cette erreur, source de discussions nombreuses. C'est la position des tentacules dans l'animal nageant. Nous avons souvent eu l'occasion de l'examiner tandis qu'elle flotte tranquillement ou nage avec vivacité. Ses tentacules sont excessivement longs et tandis que les plus grands recourbés d'abord vers le sommet traînent ensuite dans le sillage de la méduse, les plus petits sont dirigés vers le bas. Cette habitude se marque encore généralement dans la position des tentacules de l'individu conservé. Par là a pu naître l'idée inexacte de l'existence de deux sortes de tentacules.

Distribution:

Melicertum octocostatum est une espèce septentrionale boréale qui fréquente surtout les côtes de l'Écosse, de l'Islande et de la Norvège; elle fait parfois son apparence au canal de la Manche et à Helgoland et est assez souvent portée par le courant jusqu'au Cattegat même jusqu'à la Mer Baltique. — A l'ouest de la Norvège elle n'a été constatée qu'au sud de Stat, mais Linko (1904, p. 218, *Melicertum campanula*) l'a trouvée à quelques reprises près de la côte de Murman. — Les endroits de trouvailles norvégiens jusqu'ici connus sont comme suit: Dröbak en automne (Ehrenberg 1836, p. 77, *Melicertum campanulatum;* Sverdrup 1921, p. 22); les parages de Bergen en juillet—août (Broch 1905, p. 7; Kramp 1919, p. 55); Florö en grand nombre depuis le printemps jusqu'à septembre (M. Sars 1835, p. 24, *Oceania octocostata).*

Quoique l'une des plus fréquemment observée, *Melicertum octocostatum* n'est pas cependant l'une des plus abondantes. Cette constatation à première vue paradoxale s'explique par le fait que différant en cela de la plupart des autres espèces, elle ne craint pas les eaux de surface toujours plus ou moins mélangées d'eau douce. Il en résulte qu'elle échappe moins à l'observation directe. Mais par contre, si on considère le résultat des pêches pélagiques faites à l'aide d'engins traînés aux diverses profondeurs on constate qu'elle est relativement plus rare qu'on ne le croirait à première vue. Sauf quelques exceptions, chaque pêche ne rapporte qu'un petit nombre d'individus.

Cette préférence pour les eaux saumâtres explique aussi que *Melicertum octocostatum* a été recueillie surtout dans l'intérieur des fjords et parmi les localités signalées dans notre liste de capture; nous relevons surtout ces baies intérieures comme Puddefjord, le fond du fjord de Christiania (entre Steilene et Naernaes) ou ces bassins isolés Nordaasvand et Mofjord où, aux faibles profondeurs que fréquente *Melicertum octocostatum*, il y a toujours un mélange très fort d'eau douce et d'eau de mer. C'est dans de pareils endroits que notre méduse est surtout fréquente. Dans les artères principales des grands fjords norvégiens, elle se montre isolée, sans doute entraînée loin de son lieu d'origine. On constatera d'autre part qu'elle n'est signalée qu'une fois en mer (obs. 5, 12 juillet 1906, "M. S." stat. 307). Encore cette capture est-elle faite au voi-

sinage immédiat de la côte norvégienne. Elle suffit cependant pour documenter ce fait que de nombreuses méduses strictement littorales se perdent dans l'océan, entraînées par les courants.

Forme côtière, *Melicertum octocostatum* se rencontre le long de la côte méridionale de la Norvège (captures dans le fjord de Christiania, dans Jossefjord) et de toute la côte occidentale (captures dans le fjord de Lyndal au sud; dans Puddefjord, Björnefjord, Hjeltefjord, Nordaasvand, Mofjord près de Bergen; dans le Romsdalsfjord et Hjörundfjord près d'Aalesund; dans le Hadselfjord et à la station 380 du 30 août 1906 du "M. S." à la latitude des Lofoden).

Cette méduse se maintient longtemps dans le plankton. Nous avons cru reconnaître de jeunes *Melicertum octocostatum* dans de petites méduses à peine visibles à l'oeil nu trouvées à la station biologique de Bergen entre le 26 avril et le 12 mai 1908. Elles possédaient quatre canaux radiés seulement et une dizaine de tentacules. Tout à fait authentique est la capture du 20 mai 1906 qui se rapporte à un jeune individu dont les organes génitaux sont à peine indiqués par un épaississement du premier tiers des huit canaux radiés. A la même époque, on trouve déjà des individus de belle taille. Le même fait se constate pendant le début de l'été. A l'automne, on trouve souvent de grands individus dont les gonades sont plissées et bondées de produits sexuels mûrs. Nous pouvons donc admettre que *Melicertum octocostatum* se reproduit pendant le printemps et l'été et disparaît vers la fin de l'automne.

Elle ne fait même pas défaut en hiver comme le montrent les captures faites le 6 décembre 1907. Le nombre élevé de 33 individus a été recueilli dans le Mofjord. Mais les conditions spéciales présentées par ce bassin demandent une analyse particulière. Nous aurons à y revenir dans la partie générale.

30. *Mitrocoma polydiademata* (Romanes).

Matériel:

No.	Date		Situation	Origine		Observations
*1.	1901	5.VII	Gimsöströmmen	"M. S."	stat. 150	
2.	1904	27.VI	57° 48' N—9° 21' E.	—	— 237	2 expl., diam. 8—12 mm
3.	—	6.VII	57° 08' N—2° 11' E.	—	— 276	9 expl., 9—12 mm
4.	—	23.VII	67° 20' N—11° 52' E.	—	— 319	2 expl., 13—15 mm
5.	1905	25.V	62° 43' N—3° 42' E., surface	—	— 30	1 expl., 10 mm

Date	Situation	Origine	Observations
06 31.III	Ullaholm--Kroksholm	“M. S.“ stat. 62	1 expl., fort jeune
— 20.IV	61° 15’ N – 1° 35’ E.	— — 104	
— 30.IV	62° 59’ N—5° 09’ E.	— — 160	jeunes expl.
— —	62° 55’ N – 4° 57’ E., 100 – 0 m	— — 161	
— mai	Puddefjord	Stat. biol. Bergen	
— 12.V	Samnangerfjord	“M. S.“ stat. 179	7 expl., 9—15 mm
— —	Björnefjord	— — 181	10 expl., 5—14 mm
— 15.V	—		10 expl., 10—18 mm
— 19.V	Hjeltefjord, 200—0 m	— — 189	
— 21.V	60° 44’ N—4° 45’ E., 200—0 m	— — 191	1 expl., 17 mm
— 22.V	60° 40’ N – 2° 23’ E.	— — 194	
— 23.V	60° 37’ N—0° 23’ O.	— — 197	
— 26.V	Sulefjord, 137—0 m	— — 205	3 expl., 17—21 mm
— 28.V	Haröfjord, 75—0 m	— — 207	4 expl., 6, 7, 14, 24 mm
— —	Björnsund—Galdreskaer	— — 208	27 expl., 8—20 mm
— —	63° 21’ N—6° 14’ E.	— — 211	
— —	63° 10’ N—6° 14’ E.	— — 212	
— 29.V	9 milles N.O. $^1/_2$ O. d’Ona	— — 213	
— 30.V	Hessefjord	— — 223	
— —	Vaeringsaet—Hareid	— — 224	
— 31.V	62° 19’ N – 4° 35’ E.	— — 226	
— —	62° 14’ N—3° 53’ E.	— — 227	
— 2 VI	Aspevaagen, surface	—	nombreux expl.
— 5.VI	Borgundfjord	— — 237	
— 7.VI	Hjörundfjord	— — 247	
— 28.IV	60° 38’ N – 2° 35’ E., 117—113 m	— — 291	8 expl., 8—15 mm
— 11.VII	Sulefjord	— — 304	1 expl., 19 mm
908 10.V	Sultindsvik, 50—10 m	— — 68	
— 16.VI	Malangsfjord	— — 89	1 expl., 4 mm
— —	Andsnaes—Tenskaerholm	— — 90	
— —	Aglapsbaaen—Gibostad	— — 91	3 expl., 6—9 mm
— —	Hekkingen—Edö	— — 92	
— 22.VI	69° 51’ N—19° 49’ E.	— — 129	

Jusqu’ici cette méduse n’a été connue que d’une région assez étroitement limitée, vu, la partie septentrionale des côtes de la Grande-Bretagne, des îles Féroé, des eaux danoises et de Bergen. Un exemplaire recueilli à Byfjord près de Bergen le 5 juin 1900 a été décrit par Browne (1903, p. 17) comme une nouvelle espèce, *Mitrocomella fulva*, mais Browne lui-même l’a plus tard reconnu comme identique avec *M. polydiademata*. Cet exemplaire a jusqu’ici

été le seul représentant norvégien de cette espèce qui se prouve maintenant selon notre collection être fort commune le long de toute la côte norvégienne jusqu'à 70° de lat. nord. Elle apparaît au printemps: 31 mars 1906 (obs. 6), 1 expl. fort jeune. Aux parages d'Aalesund de jeunes exemplaires en avril. Nombreuse en mai et au commencement de juin, disparaît vers la fin de juin ou un peu en avant en juillet (11 juillet 1906, Hjörundfjord). L'espèce est commune dans les fjords et les skjaergaards de Bergen, d'Aalesund et des Lofoden, et a aussi été recueillie près de Tromsö (stat. 129, 1908), mais encore en pleine mer elle est assez fréquente, dans la Mer du Nord, a l'est de l'Écosse et des îles Shetland et à hauteur de la côte occidentale de la Norvège, depuis Bergen jusqu'aux Lofoden.

31. *Cosmetira pilosella* (Forbes).

Matériel:

No.	Date	Situation	Origine	Observations
1.	1905 sept.	Puddefjord	Stat. biol. Bergen	3 expl., diam. 17, 19, 24
2	— nov.	—	— — —	

La distribution de *Cosmetira pilosella* n'est pas vaste. Elle est nombreuse dans La Manche et a aussi été signalée d'un petit nombre de localités des côtes britanniques, des îles Shetland et du Skagerack.

A la côte norvégienne elle semble peu fréquente, elle n'a été constatée que de Puddefjord près de Bergen en septembre et novembre 1905. Les exemplaires de novembre ont été référés par Broch (1905, p. 7) à *Irene viridula* (voir Hartlaub 1909).

Aux côtes britanniques elle apparaît plus tôt dans l'été.

Les individus de Puddefjord ont peut-être été portés là par le Gulf-Stream,

32. *Tiaropsis multicirrata* (M. Sars).

Matériel:

No.	Date	Situation	Origine	Observations
1.	1900 19.VII	Storfjord, 200—0 m	"M. S." stat. 4	8 expl., diam. 11—16 mm
2.	1906 14.III	Puddefjord	— — 1	7 expl., 2—4 mm
3.	— 31.III	Ullaholm—Kroksholm	— — 62	5 expl., 1—1½ mm
* 4.	— 10.IV	Puddefjord		
5.	— 25.IV	Storfjord		13 expl., 3—10 mm

Date		Situation	Origine		Observations
)6	26.IV	Finö—Synaes, 30—0 m	"M. S." stat.	131	
-	mai	Puddefjord	Stat. biol.		4 expl., 5—10 mm
-	12.V	Björnefjord, 500—0 m	"M. S." stat.	180	
-	—	—	— —	181	1 expl., 11 mm
-	28.V	Haröfjord	— —	207	2 expl., 7 mm
-	11.VII	Hjörundfjord	— —	305	1 expl., 15 mm
)8	22.V	Förde	— —	11	3 expl., 12—17 mm
)9	15.VI	Havnevaag, Malangsfjord	— —	86	

Tiaropsis multicirrata est une méduse néritique fort commune des deux côtes de l'Atlantique septentrionale, surtout des régions subarctiques et boréales. Elle se trouve dans la Mer du Nord et partout aux côtes des îles Britanniques, mais elle n'est guère nombreuse. Elle a aussi été signalée aux îles Féroé et en grand nombre à la côte du Nord de l'Islande. Elle est également constatée de la Mer de Barentz.

De la côte norvégienne nous ne connaissons que deux trouvailles de cette méduse: M. Sars (1835, p. 26) l'a trouvée près de Bergen, et puis elle a été recueillie à Kalvaag, au sud de Stat en juin 1903 (Broch 1905, p. 7; Kramp 1919, p. 81).

Elle n'a jamais été recueillie en pleine mer devant la côte occidentale de la Norvège; par contre elle est fréquente dans les fjords autour de Bergen et d'Aalesund. Une seule fois elle a été recueillie à une localité septentrionale aussi haute que Malangsfjord près de Tromsö. Les jeunes individus apparaissent bien tôt au printemps (mars—avril). Des individus en maturité se trouvent encore en juillet, après quoi la méduse disparaît du plankton.

33. *Halopsis ocellata* A. Agassiz.

Matériel:

Date		Situation	Origine		Observations
)01	24.VI	67° 16' N—11° 40' E.	"M. S." stat.	140	
—	—	67° 25' N—12° 33' E.	— —	141	
—	25.VI	Près de Landegode	— —	142	
—	27.VI	Embouchure de Ofotenfjord	— —	146	
—	5.VII	Gimsöströmmen	— —	150	
—	—	Skallen	— —	151	
)04	22.VII	65° 29' N—8° 44' E.	— —	312	
—	23.VII	67° 20' N—11° 52' E.	— —	319	1 expl., diam. 29 mm

No.	Date		Situation	Origine		Observations
9	1904	30.VII	ca. 64⁰ N—3⁰ E.	"M. S." stat.	336	
10.	1906	12.V	Samnangerfjord, 150—0 m	—	— 179	3 expl., 12—15 m
11.	—	15.V	Björnefjord	—	— 180	3 expl., 12, 18,
12.	—	20.V	Feje	—	— 190	1 expl., 9 mm
13.	—	22.V	60⁰ 40' N—2⁰ 23' E.	—	— 194	1 expl., 22 mm
14.	—	28.V	Haröfjord	—	— 207	2 expl., 22—25 m
*15.	—	—	Björnsund—Galdreskaer	—	— 208	
*16.	—	—	63⁰ 21' N—6⁰ 14' E.	—	— 211	
*17.	—	30.V	Hessefjord	—	— 223	
*18.	—	—	Vaeringsaet—Hareid	—	— 224	
*19.	—	7.VI	Hjörundfjord	—	— 247	
*20.	—	11.VI	Storfjord	—	— 253	
*21.	—	10.VII	Hjörundfjord	—	— 304	
22.	—	11.VII	Sulefjord	—	— 305	3 expl., 20, 26,
23.	—	26.VIII	68⁰ 20' N—8⁰ 00' E.	—	— 371	1 expl., 42 mm
24.	—	—	69⁰ 10' N—6⁰ 30' E.	—	— 372	2 expl., 27—44 m
25.	—	29.VIII	69⁰ 36' N—16⁰ 39' E.	—	— 379	20 expl., 18—57 m
26.	—	31.VIII	67⁰ 08' N—12⁰ 08' E.	—	— 384	1 expl., 33 mm
27.	1909	10.V	Malangsfjord	—	— 67	1 expl., 12 mm
28.	—	16.VI	Aglapsbaaen—Gibostad	—	— 91	1 expl., 12 mm
*29.	—	—	Hekkingen—Edö	—	— 92	
30.	—	22.VI	69⁰ 45' N—19⁰ 45' E.	—	— 127	1 expl., 24 mm

Identification:

Dès 1901, nous trouvons de nombreuses notes dans le journal de bord relativement à une méduse rosée à nombreux canaux radiaires; forme éminemment caractéristique par sa grande taille, sa couleur et son peu de consistence, elle était particulièrement abondante dans les parages des Lofoden.

Sa détermination exacte a cependant tardée. Cette méduse en effet se conserve relativement mal et les individus défigurés que contiennent les collections ont donné lieu à des descriptions souvent très inexactes.

Une nouvelle description détaillée basée sur l'examen d'individus conservés a été faite par Kramp (1919, p. 65) mais nous avons pensé qu'il serait utile de donner ici quelques notes basées sur l'examen d'individus vivants observés en meilleure condition. Nous avons eu souvent l'occasion d'en récolter un nombre considérable à la fois en 1906, et à diverses reprises nous en avons tenu en aquarium pendant un temps prolongé.

Les exemplaires conservés sont généralement plats, presque disciformes. La méduse vivante (fig. 26) est extrêmement contractile:

en repos l'ombrelle a une largeur d'environ 4 fois la hauteur, elle adopte pourtant parfois la forme d'un disque, d'une coupole ou d'un globe. Quand l'ombrelle est en repos une faible sinuosité se fait voir à son bord à la hauteur de chaque canal radiaire. Les mouvements de la méduse sont fortes et elle nage avec beaucoup d'énergie. La longueur des tentacules est de $^1/_3$—$^1/_2$ du diamètre de l'ombrelle. Toute la méduse est d'une couleur rosée.

Le plus grand de nos individus conservés est de 57 mm en diamètre, nous avons tout-de-même mesuré des individus vivants

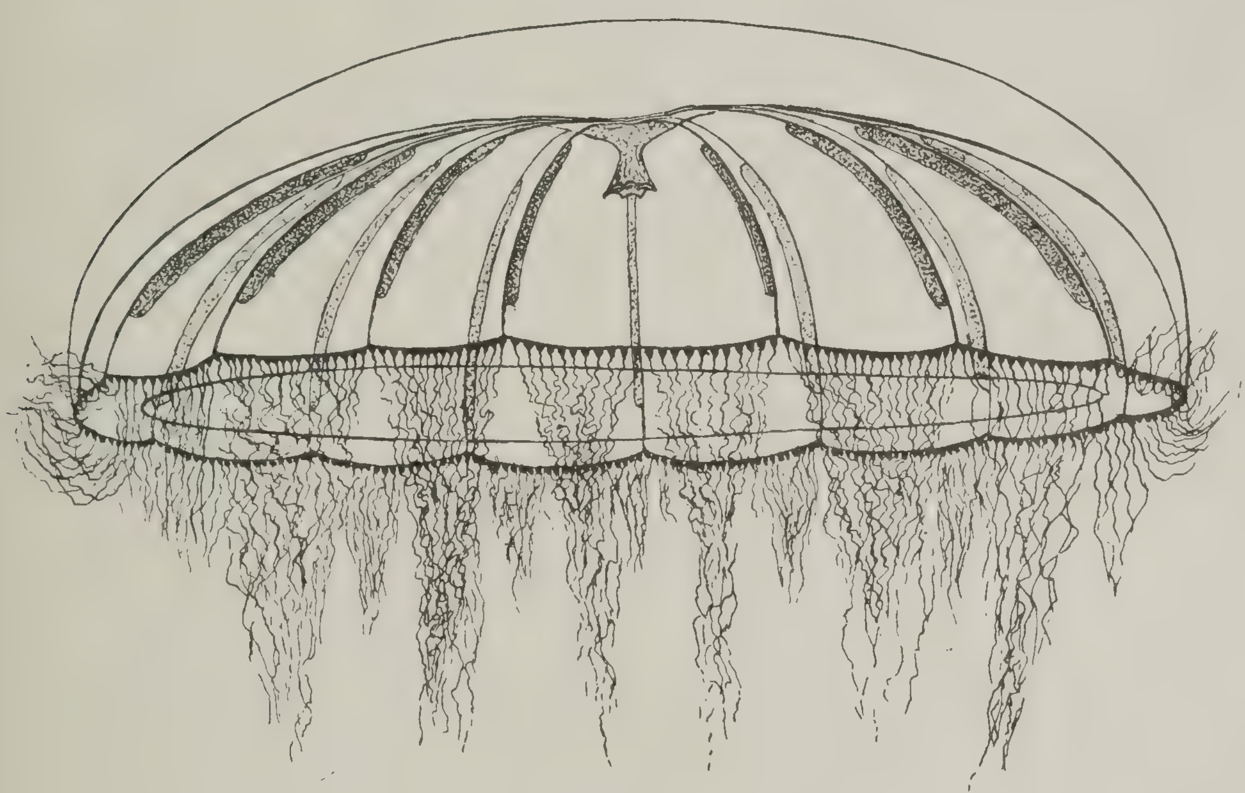


Fig. 26. *Halopsis ocellata* A. Agassiz. D'aprés un individu vivant.

de 70 mm ou d'encore plus, c'est à dire surpassant en diamètre les individus américains (voir Kramp op. cit., p. 67).

L'intérêt s'attache spécialement à un certain nombre de jeunes exemplaires, les plus petits individus européens jusqu'ici constatés (le plus petit exemplaire, mentionné par Kramp, mesurant 20 mm en diamètre):

Diam. 9 mm	14	canaux	radiaires	(stat.	190, 1906)
„ 12 „	11	—	—	(„	179, 1906)
„ 12 „	12	—	—	(„	379, 1906)
„ 12 „	14	—	—	(„	67, 1909)
„ 12 „	15	—	—	(„	180, 1906)
„ 12 „	17	—	—	(„	91, 1909)
„ 14 „	14	—	—	(„	179, 1906)
„ 15 „	16	—	—	(„	„ „)
„ 18 „	13	—	—	(„	180, 1906)

Chez les individus norvégiens de plus de 20 mm en diamètre nous avons trouvé le nombre moyen des canaux radiaires d'être 14,8, le nombre variant de 11 à 17. Il est donc évident qu'à une dimension de ca. 1 cm les jeunes individus ont déjà obtenu le nombre complet des canaux radiaires.

Nous donnerons du reste les renseignements suivants sur le plus petit des individus mesurés (9 mm): estomac 2 mm de diamètre, le long des 14 canaux radiaires de toutes jeunes gonades apparaissent assez longues et tout-à-fait minces; il y a 35 tentacules développés et le même ou un plus grand nombre de jeunes tentacules poussants.

Nous appellerons aussi l'attention à deux exemplaires d'une anomalie toute spéciale de la station 379, 1906: l'un d'eux est de 38 mm en diamètre et a trois estomacs d'où procède un total de 15 canaux radiaires (3—5—7); l'autre est de 33 mm en diamètre, a cinq estomacs et 16 canaux radiaires.

Distribution:

Il fut une grande surprise quand il fut constaté que cette grande méduse caractéristique, autrefois seulement reconnue de la côte d'est de l'Amérique du Nord, est commune dans les parages à l'ouest des îles Britanniques et au sud de l'Islande (Kramp 1919). Encore plus grande fut-elle quand il parut qu'elle est aussi fort commune le long de presque toute la côte occidentale de la Norvège.

Le nombre des captures authentiques est important. Elles se répartissent sur la période du 10 mai au 31 août. Cette méduse apparaît par conséquent au printemps pour disparaître vers la fin de l'été.

Elle est surtout fréquente dans les fjords occidentaux de la Norvège. Plus rare au sud de Bergen, elle est extrêmement commune dans les fjords de la province de Romsdal, de Trondhjem, de Molde ainsi que dans les parages des Lofoden et du Finmark. Dans les pêches pélagiques à l'aide du chalut de Petersen traîné horizontalement pendant un temps prolongé, elle était représentée par un nombre souvent considérable d'individus dont la couleur rouge vineux donnait une teinte caractéristique à la masse gélatineuse. Ces essais souvent répétés nous ont convaincus qu'elle se tient sous les eaux de surface, où elle est rare. Non pas complètement absente toutefois, car des courants boréaux convexion verticale ou

l'absence d'eau saumâtre lui permet parfois de remonter, ainsi que nous l'avons constaté à Molde en 1906.

Extrêmement commune dans les fjords et encore présente dans les chenaux du skjaergaard, elle devient de suite beaucoup plus rare en pleine mer. Un fait digne d'être relevé est en effet l'absence totale de cette méduse dans nos collections faites au nord du Cap Stat, durant les mois de mai et le début de juin, période pendant laquelle cette méduse est très commune dans les eaux intérieures. Par contre, nous la trouvons sporadiquement au large en fin juin, juillet et août, et l'on est sans doute en droit de conclure qu'elle opère une migration horizontale importante à la fin du printemps et au début de l'été. On remarquera qu'en juin les captures de 1901 sont localisées dans la grande base de Vestfjord ou au voisinage immédiat des Lofoden et des Vesteraalen, et nous pouvons sans aucun doute attribuer ici une valeur aux observations négatives produites par les pêches pélagiques exécutées plus au large à l'aide des mêmes chaluts. En juillet 1904 (stat. 312, 313, 319 et 336), elle a été constatée à une distance beaucoup plus considérable de la côte et au dessus de profondeurs dépassant 1000 brasses. En août 1906, à la latitude des Lofoden elle se trouvait à une distance maximale de la côte entre Jan Mayen et la Norvège, par conséquent loin des lieux qui peuvent lui avoir donné origine (stat. 371 et 372). Ces constatations éparses permettent de se faire une idée préliminaire de la migration horizontale de cette méduse.

Enfin, un intérêt particulier s'attache à l'exemplaire récolté à la stat. 194 de l'année 1906 (obs. 13). Il a été capturé sur le plateau de la Mer du Nord et prouve que cette méduse n'y fait pas défaut.

34. *Obelia nigra* Browne.

Matériel:

Date		Situation	Origine	Observations
906	16.III	Puddefjord	"M. S." stat. 1	3 jeunes expl.
—	mai	do.	Stat. biol. Bergen	4 adultes expl.
—	28.V	Haröfjord	"M. S." stat. 207	16 expl.
—	22.IV	Borgundfjord		2 jeunes expl.
—	15.V	Björnefjord		1 expl.
907	28.VIII	Hjeltefjord		4 expl.

La méduse *Obelia nigra* est connue d'autrefois des côtes britanniques, des îles Féroé, de l'Islande, des eaux danoises et des localités suivantes des côtes de la Norvège: les parages de Risör au Skagerack en avril et mai (Broch 1905, p. 7); Hjeltefjord, Herlösund et Osund en mars et avril (Browne 1903, p. 16). Probablement elle est la méduse de *Laomedea longissima*, espèce avec distribution vaste, presque cosmopolite, apparaissant p. ex. à toutes les côtes de l'Europe du Nord. Dans notre collection nous avons des exemplaires des fjords de Bergen et d'Aalesund depuis le mois de mars jusqu'à la fin d'août.

35. *Phialidium hemisphaericum* (L.)

Matériel:

No.	Date		Situation	Origine	Observations
1.	1906	25.IV	Storfjord		1 expl., diam. 15 m
2.	—	12.V	Samnangerfjord	"M. S." stat. 179	1 expl., 15 mm
3.	—	28.V	Haröfjord	— — 207	1 expl., 18 mm
4.	—	25.VIII	67° 08' N—10° 35' E.	— — 369	19 expl., assez jeu s
5.	—	31.VIII	67° 30' N—11° 00' E., surface	— — 383	13 expl., 7—8 mm
6.	—	8.X	Près de Haugsholmen	— — 434	2 expl., 7—8 mm
7.	1907	28.VIII	Hjeltefjord		13 expl., 3—6 mm et 1 expl. 10 m
8.	—	29.X	do.		2 expl.
9	1908	19.V	Bergen, surface	Stat. biol.	1 expl., 15 mm
10.	—	oct.	Herlöfjord	— —	12 expl., 5—10 mm
11.	—	11.-12.X	Puddefjord	— —	très jeunes expl.
12.	—	13 X	do.	— —	1 expl., 2 mm
13.	—	21.-27.X	do.	— —	4 expl., 1—5 mm
14.	—	30.X	Os	— —	1 expl., 6 mm
15.	—	29.X – 5.XI	Solsvik	— —	nombreux expl., 1—1

Phialidium hemisphaericum est une méduse très fréquente à toutes les côtes de l'Europe du Nord, depuis La Manche jusqu'à la côte méridionale de l'Islande et le long de la côte occidentale de la Norvège. Elle a probablement une distribution encore beaucoup plus large, car l'hydroïde *(Campanularia johnstoni)* est connue de la Méditerranée, de la Mer de Sargosse, de la côte d'est de l'Amérique du Nord et du Pacifique. Broch (1918, p. 163) indique l'hy-

droïde comme une forme méridionale; Bergen et Hammerfest sont les seuls endroits de la côte occidentale de la Norvège où elle a été recueillie. La méduse vit au fjord de Christiania, d'où elle a déjà été décrite par O. F. Müller (1777). De la côte occidentale elle n'a jusqu'ici été signalée que des parages de Bergen (Browne 1903, p. 18, *Phialidium temporarium;* Broch 1905, p. 6, *Thaumantias hemisphaerica).*

Parmi nos exemplaires il y a plusieurs individus des fjords de Bergen et d'Aalesund. En pleine mer, où elle n'a pourtant été que rarement recueillie, elle monte beaucoup plus vers le nord, jusqu'à la pointe du sud des Lofoden (août 1906). En plein été il n'y a que d'assez petits individus à observer, se référant à la forme d'été; ils restent toujours de dimension petite, se reproduisent et disparaissent au courant de l'été et de l'automne. Jusque bien avant dans l'automne on trouve de jeunes individus dont la plupart hivernent et atteignent des dimensions considérables avant de se reproduire au printemps prochain. Ce sont ces grands exemplaires (15—18 mm en diam.) de la forme hivernale que nous trouvons en avril et mai; pendant ces mois les petits individus font complètement défaut.

36. *Phialidium islandicum* Kramp.

Matériel:

Date	Situation	Origine	Observations
)6 22.V	60° 40' N—2° 23' E.	"M. S." stat. 194	7 expl., diam. 20, 22, 24, 25, 26, 27, 31 mm
- 23.V	60° 40' N—0° 23' O.	— — 197	4 expl., diam. 28, 30, 30, 34 mm

Cette méduse pouvant atteindre la dimension de 40 mm, n'a été connue jusqu'ici que d'Islande où elle a été signalée auprès de toutes les côtes pendant les mois de juillet et d'août (voir Kramp 1919, p. 95—97). Il est intéressant à constater que cette espèce a maintenant été recueillie au mois de mai entre les îles Shetland et la Norvège.

37. *Octocanna funeraria* (Quoy & Gaimard).

Dianæa funeraria Quoy & Gaimard 1827, p. 184, pl. 6, fig. 10—15.
Octocanna funeraria Maas 1911, p. 3.

Matériel:

No.	Date	Situation	Origine	Observations
1.	1906 24.IV	Hjörundfjord, 424 m	"M. S." stat. 120	4 expl., diam. ca3
2.	— 12.V	Björnefjord, 500—0 m	— — 180	1 expl., 52 mm
3.	— 7.VI	Hjörundfjord, 700 m wire	— — 248	nombreux expl.
4.	— 5.IX	Sulefjord	— — 398	1 expl., 41 mm
5.	— 29.XI	Hjörundfjord, 400 m		nombr. expl., 10-5
6.	1907 30.VII	Hjeltefjord		7 expl., 12—38 m
7.	1908 oct.	Herlöfjord, 300 m		1 expl., 5 mm

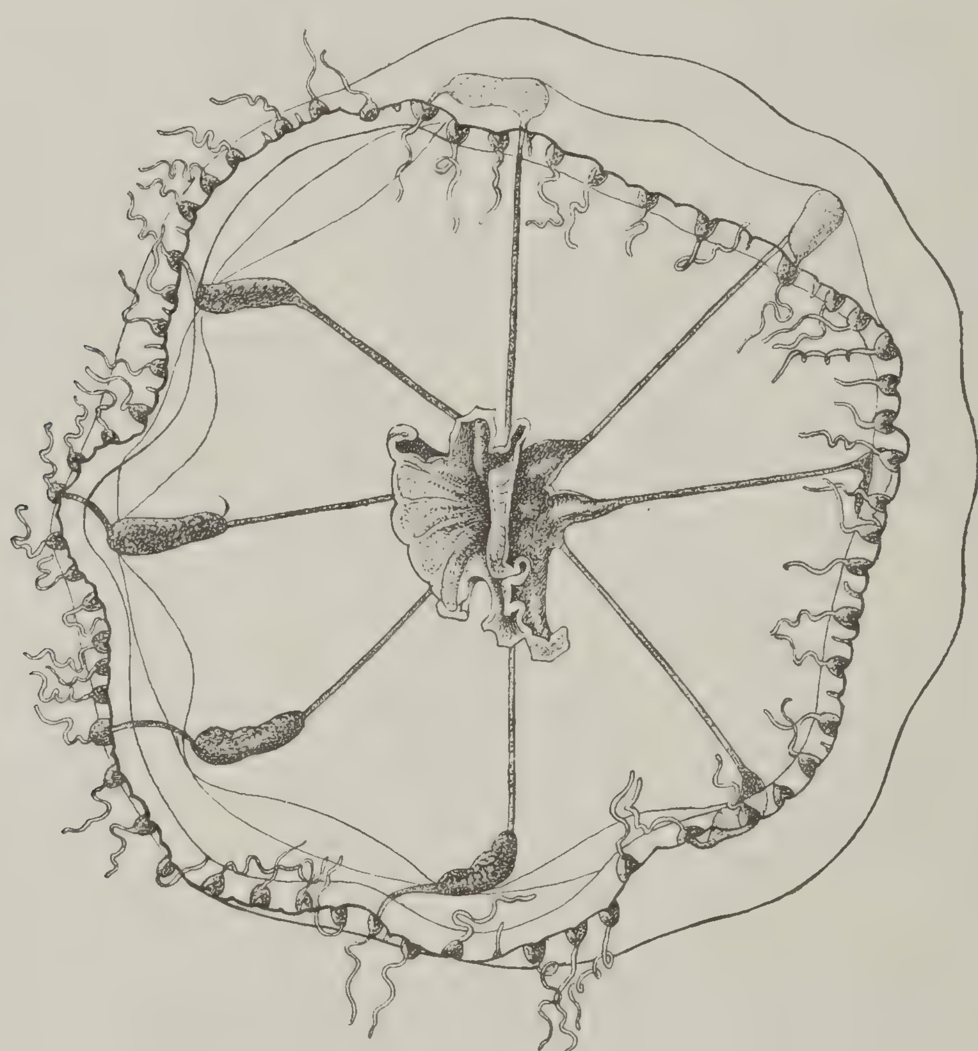


Fig. 27. *Octocanna funeraria* (Quoy et Gaimard). D'après un individu conservé.

Description:

La mésoglée très épaisse forme un disque lenticulaire. Dans une section suivant un des diamètres, la mésoglée offre une tranche ovalaire (fig. 29) qui répond à la forme générale lenticulaire de la méduse. Du côté exombrellaire, la section présente une

légère dépression aux deux côtés du sommet: c'est la trace d'un sillon circulaire peu marqué entourant le sommet de l'ombrelle. Un second sillon circulaire moins marqué encore suit la périphérie. Au niveau du bord de la lentille mésogléoidale, l'ombrelle s'amincit tout à coup. Cette portion du disque seule mobile est fort réduite. Du côté sous-ombrellaire, la mésoglée

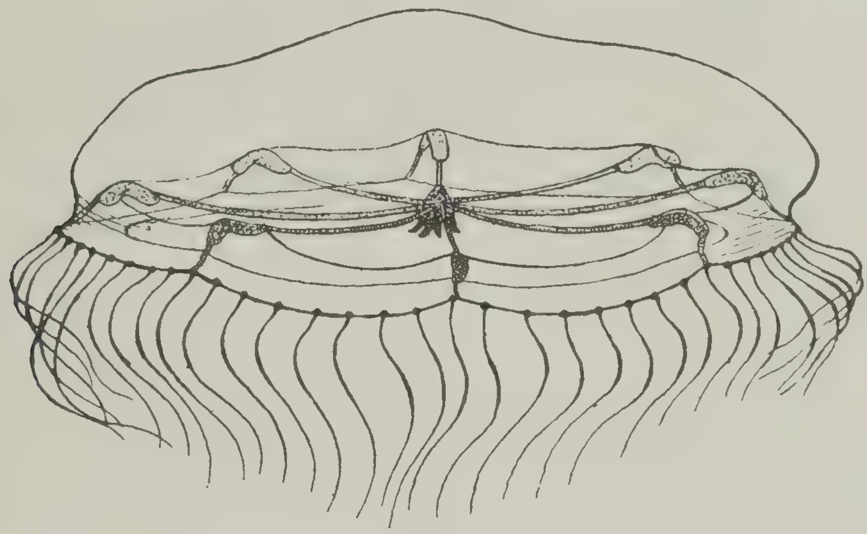


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Fig. 28—29. *Octocanna funeraria* (Quoy et Gaimard). — Fig. 28. D'après un individu vivant, nageant. — Fig. 29. Coupe méridionale, parcourant deux canaux radiaires.

saille en un cône peu élevé au sommet duquel siège l'estomac. Il en résulte que la cavité de la sous-ombrelle est réduite à un sillon circulaire limité par la partie périphérique de la lentille mésogléoidale et la partie amincie de l'ombrelle prolongée par le vélum. Enfin, du côté exombrellaire existe un sillon circulaire plus ou moins marqué suivant l'état de contraction, au point ou la partie mobile de l'ombrelle s'insère sur la lentille centrale.

Outre ces sillons circulaires, l'ombrelle est marquée d'une double série de dépressions radiaires. Du côté exombrellaire nous trouvons

seize crêtes alternant avec seize goutières. Elles sont d'ailleurs peu marquées et point reconnaissables à des exemplaires conservés. Du côté sous-ombrellaire, on observe huit incisions plus nettes au fond desquelles siègent les 8 canaux radiaires et les organes génitaux.

La surface externe de la méduse est absolument lisse, elle présente de beaux effets d'irisation.

La partie périphérique, ou mobile du disque offre un bord légèrement festonné. Cette partie dans laquelle seule les muscles sous-ombrellaires sont développés, est faible et délicate. Il en est de même du vélum.

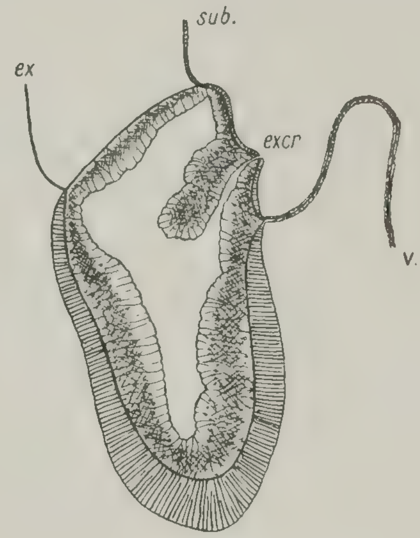
L'estomac forme une colonne cannellée. Sa base est étirée en pointe au niveau de chaque canal radiaire (fig. 27). Sa diamètre basale fait à peu près $^1/_6$ de celle du disque, la longueur du tube stomacal est un peu inférieure au diamètre basal. L'estomac a 8 plis longitudinaux, il est un peu resserré près de la base. La bouche est assez élargie en état étiré et a 8 lèvres distinctement séparées et légèrement festonnées. Canaux radiaires: 8 étroits non ramifiés, allant en ligne droite de la base de l'estomac au canal circulaire. Les organes génitaux (fig. 27) occupent ca. $^1/_4$ de leur longueur, ils sont situés assez près de leur extrémité distale mais ne touchent pas au canal circulaire. Ils ont la forme d'une bande étroite et aplatie saillante dans la cavité sous-ombrellaire. L'aspect extérieur des organes génitaux est identique dans les deux sexes. Ils sont situés dans une dépression de la mésoglée à l'union des deux parties du disque. Ils sont coudés suivant la forme de la sous-ombrelle dans cet endroit. Chaque canal radiaire ne porte qu'une seule gonade entourant le canal de manière à ne laisser libre aucune raie ventrale.

Le canal circulaire est étroit.

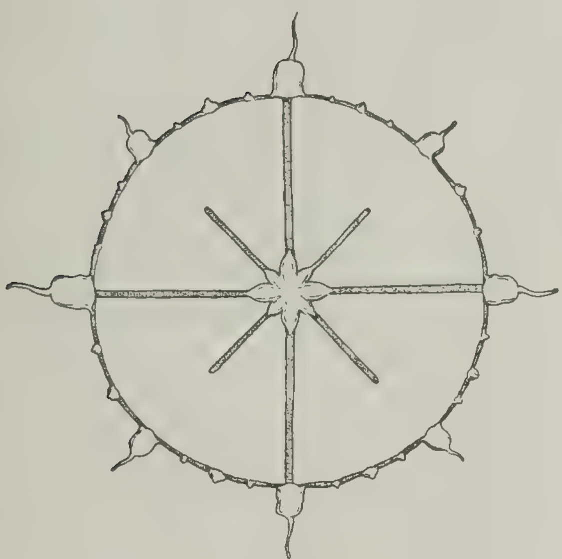
Les tentacules (fig. 30) sont nombreux: chez l'adulte, il en existe de 8 à 16 entre deux des 8 canaux radiaires; ainsi, nous comptons habituellement de 64 à 128 tentacules. Chaque tentacule s'insère sur le bord de l'ombrelle par une bulbe épaisse du surtout à un épaississement de la partie endodermique. La bulbe est assez aplatie, presque rectangulaire et nettement distinguée de la partie filiforme du tentacule provenant du côté adaxial de la partie terminale de la bulbe. Chaque bulbe tentaculaire porte une petite papille

excrétoire adaxiale à travers laquelle il y a un canal conduisant de la cavité de la bulbe jusqu'à la sous-ombrelle un peu au-dessus du vélum (voir fig. 31). Les tentacules sont creux. Le filament terminal chargé de nématocystes est long et flexible, la longueur un peu inférieure au rayon du disque. La fig. 28 donne une disposition très habituelle, quand la méduse nage librement.

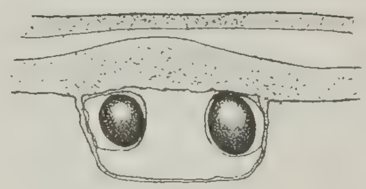
30



31



33



32

Fig. 30—33. *Octocanna funeraria* (Quoy et Gaimard). — Fig. 30. Partie du bord de l'ombrelle, pourvu de deux tentacules bien développés, trois bulbes tentaculaires encore jeunes, et huit lithocystes en différents stades de développement (voir le texte). — Fig. 31. Section longitudinale d'une bulbe tentaculaire. *ex.* exombrelle; *excr.* pore d'excrétion adaxiale; *sub.* sous-ombrelle; *v.* vélum. — Fig. 32. Lithocyste, contenant deux concrétions. — Fig. 33. Individu fort jeune, diam. 5 mm. Les quatre canaux interradiaires ne sont pas complètement développés.

Les lithocystes sont nombreux. Il y en a généralement 2, moins souvent 1, très rarement 3 lithocystes entre 2 bulbes tentaculaires successives, y compris les jeunes bulbes nouvellement ébauchées. Cela veut dire qu'aussitôt qu'un nouveau tentacule est établi à l'intervalle entre 2 anciens, ainsi séparant les 2 lithocystes, un nouveau lithocyste est bientôt développé dans chacun des deux intervalles. Les lithocystes nouveaux sont parfois reconnaissables en étant d'une dimension plus petite que celle des plus anciens et plus rapprochés des nouvelles bulbes tentaculaires que celles-ci des

tentacules anciens (fig. 30). Les lithocystes (fig. 32) sont petits et fermés et contiennent 1—3 concrétions.

Taille: atteint 40 à 50 mm en diamètre.

Couleur: Complètement transparente à l'exception de l'estomac et de la base des tentacules, dont l'endoderme a une couleur violet foncé et des organes génitaux opaques et colorés en jaune-brunâtre sillonné de veines violettes.

De cette espèce nous avons plusieurs individus de toutes dimensions, depuis 5 mm jusqu'à 52 mm en diamètre (conservés en du formol). La plupart des exemplaires sont toutefois en un état plus ou moins défectueux; surtout les tentacules se détachent facilement. Les figures d'habitus sont donc représentées selon des exemplaires relativement jeunes qui sont ordinairement mieux conservés.

Le plus jeune stade de développement jusqu'ici constaté (fig. 33) est représenté par un individu de 5 mm, provenant de Herlöfjord, octobre 1908. Il a la mésoglée relativement mince. Il y a encore 8 tentacules complètement développés et 15 ébauches de tentacules. Ce qu'il y a de plus intéressant à cet individu c'est que seulement 4 des 8 canaux radiaires ont achevé leur développement (canaux perradiaires); les 4 canaux interradiaires sont en train de se développer de la base de l'estomac, mais s'arrêtent aveuglément à la sous-ombrelle, à peu près à distance égale du manubrium et du bord de la cloche; ils ne sont pas tous de la même longueur. Des 8 prolongations coniques provenant de la base de l'estomac il y en a 4 correspondant aux 4 canaux secondaires (interradiaires) et beaucoup plus petites que les 4 prolongations primaires (perradiaires). Les 4 lèvres buccales interradiaires ont commencé leur développement mais sont encore beaucoup plus petites que les perradiaires. Les premières indications des gonades ont fait leur faible apparition *au milieu* des 4 canaux radiaires perradiaires.

Au stade immédiatement successif (diam. 10 mm, Hjörundfjord 29. nov. 1906) tous les 8 canaux radiaires sont au même stade de développement, et il en est de même avec les 8 gonades; celles-ci sont de tendres ébauches d'environ 1 mm de longueur et avec leurs extrémités distales situées à environ 1 mm du canal circulaire; ca. 24 tentacules.

Nous avons deux individus de 12 mm de diam. (Hjörundfjord

29 nov. 1906 et Hjeltefjord 30 juillet 1907) ayant relativement 25 et ca. 29 tentacules. Chez ceux-ci aussi les gonades ne sont que des ébauches à un peu plus de 1 mm du canal circulaire.

En tous les jeunes individus il est la règle que la mésoglée (des exemplaires conservés) est relativement mince et flexible; il est possible qu'elle ait été relativement aussi épaisse que celle des adultes quand l'animal était vivant, mais d'une consistance moins solide, de sorte qu'elle se soit plus rétrécie à la conservation.

Aux stades suivants de développement la longueur des gonades augmente ainsi que la distance du canal circulaire, mais en proportions différentes. A un diamètre total de 17 mm la longueur des gonades est ca. 3 mm, la distance du canal circulaire 1,5 mm. A un diamètre d'environ 26 mm les gonades sont de 3—3,5 mm, la distance 2—2,5 mm. Chez des exemplaires adultes de 30—40 mm en diam. les gonades sont 5—6 mm, à 2—3 mm du canal circulaire.

Une bonne majorité des individus sexués sont 30—40 mm en diam.; il y a rarement de plus grands exemplaires. Le plus grand individu que nous ayons observé (Björnefjord 12. mai 1906) est 52 mm en diam. et a la mésoglée très épaisse; c'est un mâle sexué.

D'après les mesures que nous avons faites des individus de différentes dimensions, et dont les résultats essentiels ont été mentionnés au-dessus, il est évident que pendant le développement de l'individu il s'opère un déplacement centrifuge du siège des gonades, pareil à celui de *Phialidium* et d'*Obelia*. C'est à dire que le développement de la partie centrale du corps se fait surtout en direction radiaire, de la partie périphère du corps surtout en direction circulaire.

Comme il s'ensuit de la description du plus jeune stade trouvé, seulement 4 des 8 canaux radiaires peuvent être regardés comme primaires. Les 4 canaux restants trahissent d'ailleurs leur origine secondaire, même aux stades plus avancés où ils sont en apparence parfaitement pareils aux 4 primaires: ils ne divisent pas exactement en deux les angles intermédiaires, il n'y a pas toujours un tentacule à leur extrémité (terminale), ou bien il y a là une toute jeune ébauche de tentacules. Nous avons déjà vu que la méduse a 8 tentacules parfaitement développés, même quand les 4 canaux radiaires secondaires n'ont pas encore atteint jusqu'au bord de la cloche. Il est donc un hasard si les canaux radiaires en atteignant

le canal circulaire s'unissent avec celui-ci juste à la hauteur d'un tentacule.

Il se trouve parfois des exemplaires à 7 ou 9 canaux radiaires, mais ils sont rares. Une anomalie assez caractéristique a été observée à un individu de 40 mm provenant de Hjörundfjord: la construction du manubrium est normale avec 8 plis longitudinaux, mais un des canaux radiaires qui est normal à son origine reste tout court et se termine aveuglément. Celui-ci est toutefois remplacé par son voisin à gauche (vu d'en haut) lançant, près de son issue, une branche latérale qui atteint le canal circulaire à peu près à l'endroit où le canal estropié aurait dû avoir sa terminaison.

Haeckel (1879, p. 261) a conçu la méduse "*Dianaea funeraria*", décrite et dessinée par Quoy et Gaimard, comme une Trachyméduse, la référant au genre *Trachynema* Gegenbaur, et l'identifiant à la méduse de la Méditerranée "*Sminthea leptogaster*" Gegenbaur. Des auteurs plus récents ont douté de la justesse de cette conception, et Mayer en parle en sa monographie (1910, p. 381) comme suit: "It will never be possible to specifically determine Quoy et Gaimard's *D. funeraria* . . . . ." Maas a fait échouer cette prophétie par son petit ouvrage en Bulletin de l'institut océanographique (1911) dans lequel il prouve incontestablement que *Dianaea funeraria* est une Leptoméduse du genre *Octocanna* Haeckel, et il réfère ce genre à la famille *Eucopidæ*. Nous pouvons absolument constater la justesse de cette preuve après avoir examiné des individus d'*Octocanna funeraria* de la Norvège et de la Méditerranée et d'*Octocanna polynema* de la Mer des Indes. Cette dernière espèce est caractérisée entre autres choses par les papilles excrétoires fort développées des bulbes tentaculaires; chez *O. funeraria* ces papilles sont toutes petites. — Par une comparaison avec de nombreux exemplaires de la Méditerranée nous avons pu constater que *Octocanna* de la Norvège s'accorde en tous rapports parfaitement avec la forme de la Méditerranée; à cela près que cette dernière ne semble pas atteindre à une dimension aussi considérable que celle des individus des fjords de la Norvège.

Distribution à la Norvège:

Cette remarquable méduse intéressante n'a pas autrefois été signalée des côtes de la Norvège, ni d'aucune localité au dehors

de la Méditerranée. D'après les investigations du "Michael Sars" elle a maintenant été recueillie en grande quantité dans quelques-uns des fjords profonds de la Norvège, tant des parages de Bergen (Björnefjord, Herlöfjord, Hjeltefjord) que d'Aalesund (Hjörundfjord et Sulefjord). Elle se tient dans la profondeur et comme chez d'autres méduses bathypélagiques sa reproduction et son développement semblent indépendants de la saison; des individus jeunes ainsi que des adultes ont été trouvés en même temps et en des saisons fort différentes.

38. *Eutonina indicans* (Romanes).

Matériel:

Date	Situation	Origine	Observations
1904 21.V	58°45' N—9°25' E., 50—20 m	"M. S." stat. 221	19 expl., diam. 9—25 mm
— 30.VI	56°03' N—6°05' E.	— — 257	50 expl., 15—25 mm
— 1.VII	55°46' N—2°35' E.	— — 262	4 expl., 17—24 mm
— 6.VII	57°08' N—2°11' E.	— — 276	1 expl.
1905 25.V	62°43' N—3°42' E., surface	— — 30	1 expl., 9 mm
1906 23.IV	Aasefjord	— — 114	
— 25.IV	Storfjord		2 expl., 5 mm
— 1.V	Près d'Aalesund	— — 165	1 expl., 18 mm
— 8.V	Puddefjord	— — 173	2 expl., 16—21 mm
— 12.V	Samnangerfjord	— — 179	1 expl., 18 mm
— —	Björnefjord	— — 180	
— 26.V	Sulefjord	— — 205	2 expl., 15 mm
— 28.V	Haröfjord	— — 207	19 expl., 20—42 mm
— —	63°21' N—6°14' E.	— — 211	
— 30 V	62°37' N—5°26' E.	— — 221	
— —	Hessefjord	— — 223	
— —	Sulefjord	— — 224	4 expl., 22—28 mm
— 7.VI	Hjörundfjord	— — 247	
— 11.VII	do. 100 m wire	— — 305	8 expl., 25—31 mm
— —	do. 200 m —	— — —	5 expl., 26—30 mm
1908 22.V	Au dehors de Förde	— — 11	

Distribution:

En dehors du Pacific du Nord cette méduse est jusqu'ici signalée de la Mer du Nord, des parages danois et des fjords de la côte du nord-ouest de l'Islande. De la côte occidentale de la Nor-

vège seulement une trouvaille avait jusqu'ici été constatée (Borgundfjord, juin 1902, Kramp, 1919, p. 99).

En effet, cette méduse est l'une des plus communes dans les fjords de la Norvège occidentale à partir de la seconde moitié du mois d'avril jusqu'en juillet. Les observations faites pendant cette période dans les fjords de la province de Romsdal nous ont permis de suivre son apparition et sa disparition. D'abord assez rare au début du printemps, elle devient de plus en plus abondante au point de ne jamais manquer dans nos captures, faites entre deux eaux. Elle disparaît au début de l'été.

Son abondance dans les eaux intérieures doit faire conclure qu'elle y est indigène. Par les chenaux du skjaergaard elle peut incontestablement être entrainée au large. C'est ce qu'indiquent les captures faites entre les îles où règne un courant qui tantôt porte vers l'intérieur. On la rencontre également sur les plateaux continentaux du Romsdal, dans le Skagerack et dans la Mer du Nord.

39. *Eutima elephas* (Haeckel).

Matériel:

No.	Date	Situation	Origine	Observations
1.	1905 septbr.	Puddefjord	Stat. biol.	2 expl. diam. 8—13 mm

Ces exemplaires-ci sont les mêmes qui ont été mentionnés par Broch (1905, p. 7). Ils représentent jusqu'ici l'unique trouvaille norvégienne de cette méduse, d'ailleurs seulement constatée de la Mer du Nord.

40. *Tima bairdii* (Johnston).

Matériel:

No.	Date		Situation	Origine		Observations
1.	1904	1.VII	55° 46' N—2° 25' E.	"M. S." stat.	262	7 expl, diam. 6, 7, 8, 44, 45, mm
2.	—	6.VII	57° 08' N—2° 11' E., 90 m	— —	276	4 expl., 15, 17, 22, 2
3.	1905	15.V	61° 14' N—3° 22' E., surface	— —	2	1 expl., 45 mm
4.	1906	17.III	Hjeltefjord	— —	4	4 expl., 23, 26, 36, 4
5.	—	22.III	61° 57' N—3° 38' E.	— —	24	1 expl., 45 mm
*6.	—	—	62° 06' N—4° 09' E.	— —	25	
7.	—	23.III	62° 20' N—5° 02' E.	— —	26	1 expl, 21 mm

Date		Situation	Origine		Observations
1906	10.V	60° 43' N—4° 29' E.	"M. S."	stat. 175	
—	—	ca. 60° 45' N—4° 30' E.	—	— 176	1 expl., 38 mm
—	18.-19.V	Puddefjord	—	— 182—188	5 expl., 40, 48, 50, 52, 65 mm
—	21.V	60° 44' N—4° 45' E.	—	— 191	1 expl., ca. 30 mm

Distribution:

Cette belle méduse, si caractéristique, n'échappe guère à l'observation et se trouve plusieurs fois citée dans le journal de bord. Nous n'avons cependant pu utiliser toutes les notes qui en signalent la présence à cause de la ressemblance superficielle qu'elle offre avec Tiaropsis. Aussi la liste ci-devant comprend seulement les captures authentifiées par la présence des exemplaires conservés, ou par un dessin.

Cette espèce n'a jusqu'ici été constatée que de la côte d'est de l'Écosse, de la partie centrale de la Mer du Nord et des parages danois, elle n'a pas autrefois été signalée de la côte occidentale de la Norvège.

D'une manière générale, elle est moins abondante qu'on ne s'y attendrait à priori en se basant sur la fréquence de cette méduse dans la Mer du Nord.

Les captures se répartissent en 3 groupes:

a) dans la Mer du Nord: Deux observations faites dans la partie profonde de la Mer du Nord confirment le fait très connu de sa présence dans ces régions.

b) dans la Fosse Norvégienne: (7 captures): Nous considérons la fosse profonde, qui sépare la Norvège du plateau de la Mer du Nord, comme l'endroit le plus fréquent de nos captures. *Tima bairdii* y forme un élément caractéristique de la faune à une certaine profondeur.

c) dans les fjords: elle est relativement rare. Trouvée aux environs de Bergen (Puddefjord, Hjeltefjord) et de Molde, elle n'a pas été constatée dans la région d'Aalesund, si bien étudiée cependant en 1906. Elle paraît aussi manquer vers le nord et sans doute sa distribution géographique trouve sa limite septentrionale à la côte norvégienne.

Sans être une méduse bathypélagique, elle n'est pas une forme de surface. Elle remonte rarement. La plupart des captures ont été faites entre 20 et 100 m.

41. *Aequorea forskalea* Péron et Lesueur.

Matériel:

No.	Date	Situation	Origine	Observations
1.	1904 22.VI	ca. 65° 48' N—8° 00' E.	"M. S." stat. 313	1 expl.
2.	1905 oct.	Puddefjord		

Toutes les Aequoreae européennes se réfèrent probablement à une seule espèce *Aequorea forskalea* Pér. et Les., méduse d'une vaste distribution étant le plus fréquent dans les mers tempérées et ne montant que rarement à la hauteur des côtes de la Norvège. Dans la littérature elle a été mentionnée trois fois de la Norvège: auprès de Christianssand (Haeckel 1879, p. 229, *Polycanna fungina*); Puddefjord en novembre 1905 (Broch 1905, p. 7 *Polycanna vitrina*); Moskenstrømmen, Lofoden, 1 mars 1899 (Browne 1903, p. 19, *Aequorea norvegica*).

Au cours de notre travail de collection deux individus de cette méduse méridionale ont été capturés. Il est cependant certain que cette forme si caractéristique et de belle taille ne pourrait échapper à notre attention, si elle s'était rencontrée dans nos captures.

L'exemplaire du "Michael Sars" (obs. 1) est un individu d'assez grande taille. Il mesure 35 mm de diamètre mais son disque est fortement infléchi. Il comporte 65 canaux radiaires dont plusieurs fort étroits sont de formation récente; ses gonades sont faiblement développées ou vidées. Il a subi une mutilation importante qui est en partie réparée.

On peut sans aucun doute admettre que cet individu doit avoir dérivé pendant longtemps avec le courant et peut-être n'est-il pas exagéré de penser qu'il est un immigrant provenant de régions très éloignées.

Rien ne nous permet dans tous les cas, jusqu'à présent, d'affirmer que cette méduse est indigène à la côte occidentale de la Norvège, où jusqu'à présent les stades jeunes n'ont pas été rencontrés.

Trachymedusæ.

42. *Ptychogastria polaris* Allman.

Matériel:

No.	Date	Situation	Origine	Observations
1.	1906 7.VI	Hjörundfjord, 700 m wire	"M. S." stat. 248	6 expl., 6—8 mm de [illegible]

Browne (1903, p. 24) a donné une description détaillée de cette méduse d'après des exemplaires de la Norvège septentrionale. — C'est une espèce arctique qui a été recueillie à la hauteur des côtes de Nova Scotia, du Groenland, du Spitzbergen, de la Russie septentrionale et des fjords norvégiens suivants: Kvænangenfjord, Skjerstadfjord et Foldenfjord. Elle semble surtout fréquenter les couches intermédiaires des eaux, quoiqu'elle ne soit pas rare près de la surface. — Les endroits de trouvailles jusqu'ici constatés appartiennent tous à la partie septentrionale, arctique du pays. La trouvaille de Hjörundfjord prouve qu'elle fait parfois son apparition bien plus au sud, mais alors elle se tient probablement exclusivement à des fjords profonds et d'une température assez froide tels que Hjörundfjord.

43. *Crossota norvegica* Vanhöffen.

Matériel:

Date	Situation	Origine	Observations
00 13.VIII	69° 13' N—10° 40' E., Profondeur ca. 1000 m	"M. S." stat. 46	2 expl., les originaux de Vanhöffen; diam. 20 mm

Cette espèce nous présente une des preuves les plus saillantes de la manière dont fait Vanhöffen la "description" d'une espèce. Le seul renseignement que donne Vanhöffen (1902, p. 75) sur l'apparence de cette méduse c'est qu'elle se distingue de *Crossota brunnea* par sa couleur cerise et sa plus petite dimension. Une examination réitérée des exemplaires types prouve cependant qu'elle dévie des espèces de l'Atlantique méridionale et de la Mer des Indes sur deux points de plus: elle a beaucoup moins de tentacules, et ils sont tous rangés en une série, pas en plusieurs comme chez *Cr. brunnea*. L'autre caractéristique important de *Cr. norvegica* qui a échappé à Vanhöffen c'est qu'elle a plus de 8 canaux radiaires! Les deux exemplaires types de Vanhöffen ont relativement 10 et 12 canaux radiaires, le nombre pouvant monter jusqu'à 14. Une description plus détaillée de *Crossota norvegica* d'après des exemplaires plus récemment recueillis de la mer glaciale du Nord (entre l'Islande et Jan Mayen) sera donnée dans un traité prochain par Kramp. Il faut seulement ajouter ici qu'une plus petite espèce *Cr. rufobrunnea* Kramp, avec 8 canaux radiaires et de couleur ce-

rise est largement distribuée dans la profondeur de l'Atlantique boréale mais pas dans la Mer Norvégienne ni dans la Mer Polaire.

44. *Homoeonema platygonon* Maas.

Matériel:

No.	Date	Situation	Origine	Observations
1.	1908, oct.	Herlöfjord, 300 m		19 expl., diam. 1—2

Cette petite méduse n'a été constatée jusqu'ici que de très peu de localités, vu: l'Atlantique boréale, ca. 60° N., entre l'Écosse et le point du sud du Groenland (Maas 1893, p. 15; 1906, p. 509) et des fjords norvégiens suivants: Skjerstadfjord en avril, 420—0 m et 490—0 m, et Byfjord près de Bergen en novembre, 200—100 m (Browne 1903, p. 21). — A ces endroits de trouvailles nous ajouterons maintenant Herlöfjord près de Bergen en oct. 1908 à 300 m de profondeur. Les 19 exemplaires recueillis sont tous de petites dimensions, 1—2 mm en diam; ils s'accordent parfaitement avec la description de Browne.

45. *Aglantha digitale* (O. F. Müller).

Matériel:

No.	Date		Situation	Origine	Observations
1.	1906	19.IV	62° 31' N—0° 06' E.	"M. S." stat. 99	12 expl, haut. 10—2
2.	—	22.IV	Borgundfjord		5 expl., 4—6 mm
3.	—	12.V	Björnefjord	"M. S." stat. 181	16 expl., 6—12 mm
4.	—	21.V	60° 44' N—4° 45' E.	— — 191	16 expl., 4—8 mm
5.	—	11.VII	Hjörundfjord	— — 305	6 expl., 13—23 mm
6.	—	14.VIII	60° 42' N—3° 08' E.	— — 337	3 expl., 6—9 mm
7.	—	—	60° 40' N—2° 13' E.	— — 338	407 expl., 4—10 mm
8.	—	16.VIII	62° 12' N—0° 50' E.	— — 305	ca. 120 expl., 9—15 mm
9.	1907	28.VIII	Hjeltefjord		2 expl., 2—2½ mm
10.	1908	4.VII	Entre Hodne et Espholm	— — 121	1 expl., 9 mm
11.	—	oct.	Herlöfjord		36 expl., 8—11 mm

Il n'est guère possible de distinguer plusieurs espèces d'*Aglantha* des mers boréales quoiqu'il y soit certainement plus de variétés ou de races locales qui sont mutuellement distinguées par le développement des gonades en proportion de la dimension et par le développement de la musculature sous-ombrellaire. Nous n'osons pas

entamer une discussion de ce vaste problème en ce traité-ci. Dans la liste ci-devant toutes les *Aglantha* ont été réunies sous un seul nom *Aglantha digitale*.

L'espèce est distribuée dans toute l'Atlantique septentrionale depuis le détroit de Gibraltar jusqu'aux régions arctiques, et apparaît également le long de toute la côte de la Norvège, dans les fjords, comme en pleine mer.

Narcomedusae.

46. *Solmaris corona* (Keferstein et Ehlers).

Matériel:

Date	Situation	Origine	Observations
1906 16.VIII	62° 12' N—0° 50' E., 200 m wire		5 expl., diam. ca. 10—11 mm
1907 29.X	Hjeltefjord		1 expl.

Outre ces exemplaires nous avons dans notre collection 8 individus sans indication de localité, 10—15 mm en diamètre. Les tentacules ont pu être énumérés chez 7 individus; nous en avons trouvé les nombres suivants: 31, 33, 34, 37, 37, 37, 42. Chez l'individu dernier nous avons compté 62 lithocystes. Le plus souvent il y a 1 lithocyste à chaque lobe marginal, mais chez quelques exemplaires il y en a 2. Le plus grand des individus examinés, 15 mm en diam., n'a que 31 tentacules.

Solmaris corona a d'abord été décrite de la Méditerranée. En l'Europe du Nord elle est une véritable forme du Gulf-Stream qui peut être rencontrée en grand nombre à l'ouest de l'Irlande, des Hébrides et au nord de l'Écosse. Il est probable mais pas encore prouvé qu'elle est identique avec *S. multilobata* Maas, jusqu'ici seulement constatée du nord-ouest des Hébrides.

Il se peut que cette méduse-ci soit portée chaque année par le Gulf-Stream jusqu'à la côte de la Norvège, d'où elle n'a pourtant pas été signalée que des parages de Bergen. Browne est le premier qui l'ait constatée d'ici dans Puddefjord en nov. 1898 (Browne 1903 p. 30); selon Broch (1905, p. 8) elle a été recueillie à Solsvik et à Puddefjord en août, sept. et nov. pendant les années 1903, 1904, et 1905. Parmi nos exemplaires il y a un individu de Hjeltefjord recueilli en oct. 1907.

47. *Aeginopsis laurentii* Brandt.

Matériel:

No.	Date	Situation	Origine	Observations
1	1905 19.V	$64^0 47'$ N—$4^0 53'$ O., 1000 m wire	"M. S." stat. 12	1 expl, diam. 6 mn

Aeginopsis laurentii est une méduse arctique prononcée, distribuée au Pacifique Nord comme à toute la région atlantique-arctique. *Solmundus glacialis* Grönberg de Spitzbergen est sans doute identique avec cette espèce et c'est probablement la même méduse qui est mentionnée par Broch (1905, p. 8, *Solmundus glacialis*) de Vardö de la Norvège septentrionale en juin 1905. — L'exemplaire de notre collection a été recueilli dans la profondeur glaciale de la Mer Norvégienne, à peu près à égale distance de l'Islande et de la Norvège.

La fondation scientifique de Danemark (fondation Rask-Ørsted) a contribué à la publication de cette œuvre.

Grâce à la subvention fournie de cette fondation, j'ai pu pendant un séjour prolongé à Liége, en 1920 entrer en collaboration directe avec le Professeur Damas. Également, la fondation a subvenu à la plus grande partie des frais d'imprimerie de notre travail.

C'est en conformité parfaite avec mon collaborateur que je me permets d'adresser nos remerciements sincères à la Direction de la fondation Rask-Ørsted.

J'ai aussi à remercier Mag. art. E. Koefoed, Bergen, pour les grands efforts qu'il s'est donnés afin de me procurer des renseignements nécessaires à la rédaction d'une liste alphabétique des localités, et encore pour des informations sur quelques stations du "Michael Sars".

Quelques-unes des figures du texte ont été dessinées par moi, mais la plupart et les plus belles sont dues à M. L. Julin, Liége, qui les a faites d'après des esquisses originales par Damas, ou bien selon ma direction d'après des exemplaires conservées.

Une partie du texte a d'abord été écrite en danois et plus tard

traduite en français, principalement par Damas. L'autre partie de la traduction a été faite par Mademoiselle K. Soetmann, Copenhague, à qui j'exprimerai aussi ma reconnaissance pour son travail consciencieux comme pour l'assistance valable qu'elle m'a prêtée à la lecture des épreuves.

P. L. Kramp.

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18—8—1925.

Explication de la planche.

Abbréviations:

c. cordylus; *c.c.* canal circulaire; *ex.* exombrelle; *sub.* sous-ombrelle; *vel.* vélum.

Ptychogena crocea n. sp.

Fig. 1. Vue latérale d'un exemplaire, 16 mm en diam. — × 4.

Fig. 2. Exemplaire assez jeune, 13 mm en diam. — × 4.

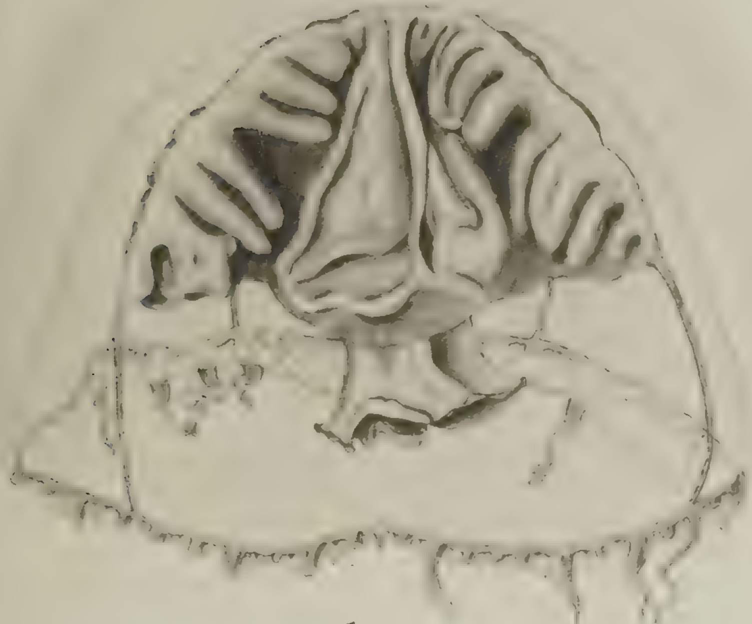
Fig. 3. Secteur de la paroi dorsale de l'estomac et un canal radiaire avec gonades. La partie orale de l'estomac a été enlevée pour fair voir le passage en fissure de l'estomac au canal radiaire. Derrière la fissure quatre des plis gonadiaux sont visibles. — × 8.

Fig. 4. Section longitudinale d'une bulbe tentaculaire. — × 50.

Fig. 5. Partie du canal circulaire avec quatre tentacules (dont deux rompus), et huit cordyles. — × 20.

Fig. 6. Section longitudinale sagittale d'un cordyle avec son tubercule. — × 50.

Fig, 7. Section transversale d'un cordyle.



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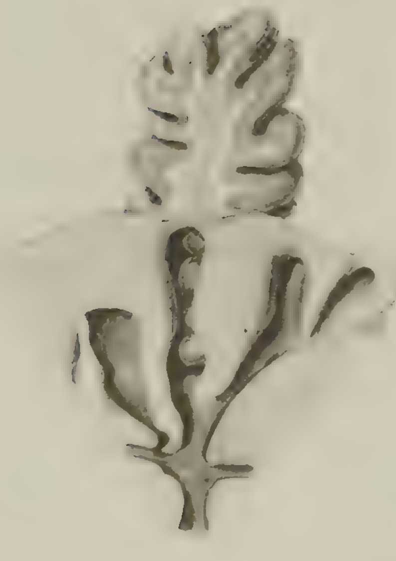

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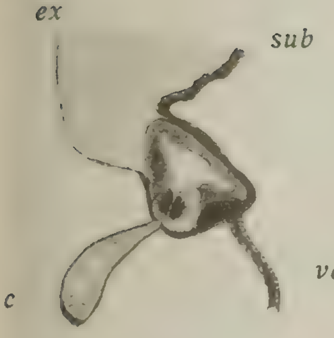

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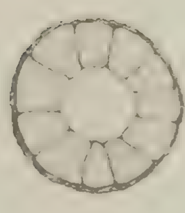

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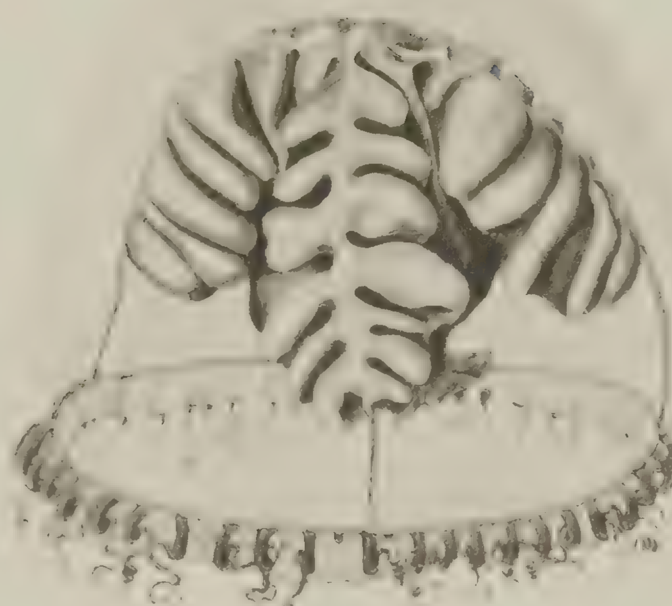

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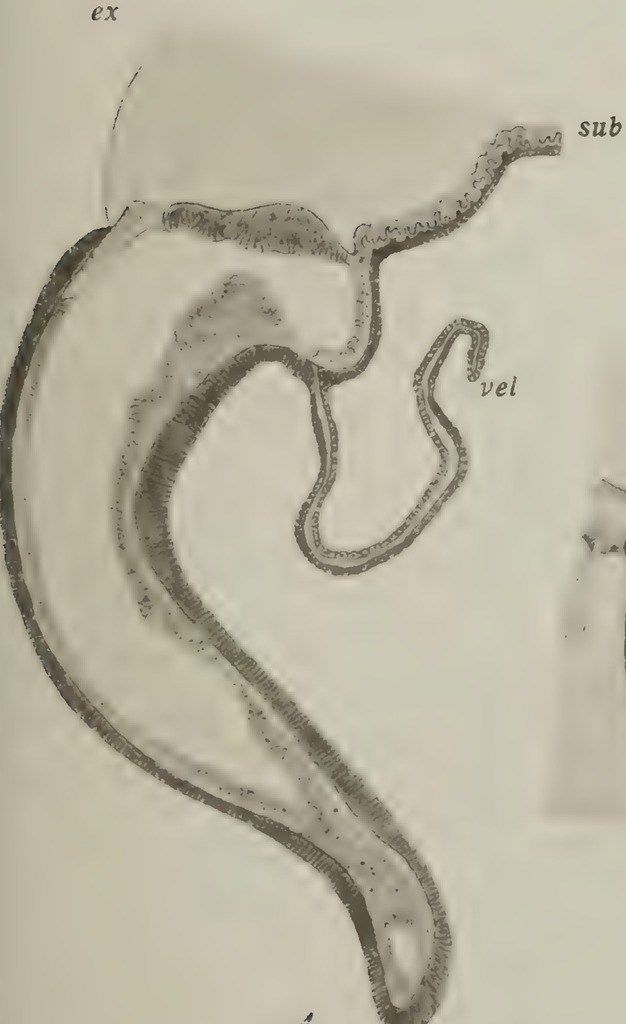

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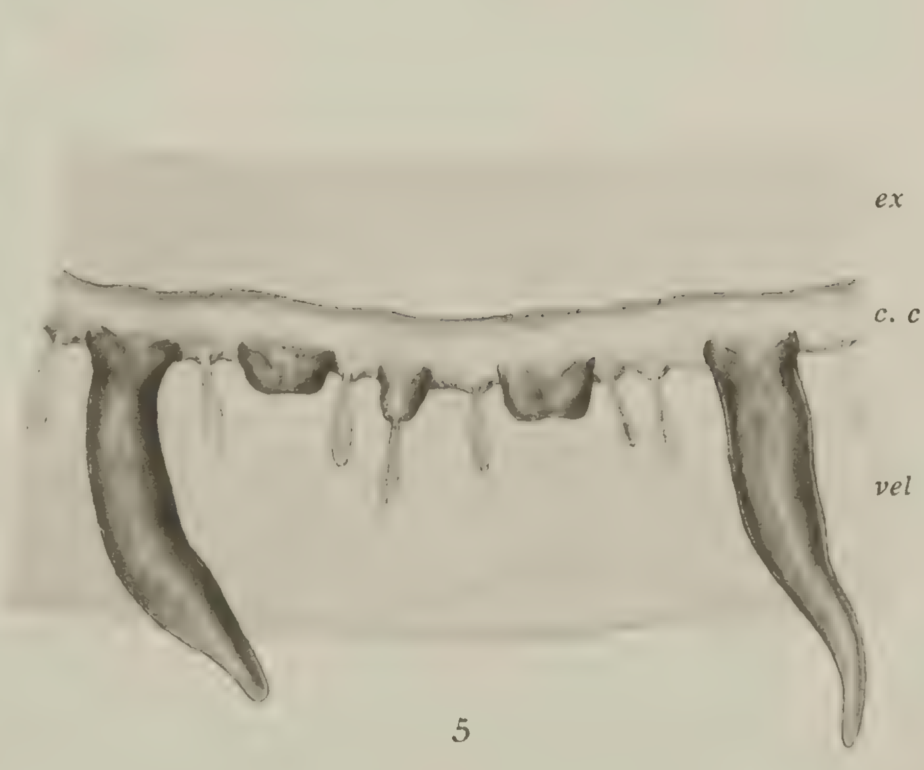


5

P. L. Kramp del. fototypi, Pacht & Crone's fetf.

Polychæta from the cruises of the Danish Research-steamer "Dana" 1922 and 23.

Contribution towards the knowledge of the distribution of the Polychæta in Danish waters.

By

Hjalmar Ditlevsen.

Zoological Museum of the University, Copenhagen.

This paper mainly deals with collections brought home by the research-steamer "Dana" in 1922—23 from Danish waters, that is to say from the North Sea, the Skagerrack, the Kattegat, the Belts, the Sound and the Baltic. Besides some material taken by the Danish investigation-steamer "Sallingsund" (now "Japetus Steenstrup") and kindly forwarded to our museum by Dr. Blegvad has been withdrawn. Also some species, taken by the author on a trip in 1912 with the same steamer and, as the species forwarded by Dr. Blegvad, mainly new to our fauna, have been dealt with on this occasion.

I beg also here to express my best thanks for the courtesy shown me by the Director of the Danish Biological station, Dr. C. G. Johs. Petersen who was kind enough to invite me to this trip.

The material at my disposal was for the greater part well preserved and, as it was only a short time after the capture when I began the working out, there was generally no difficulty in dealing wiah the single species.

No species with certainty new to science was found but one problematic, namely the Glycera sp. with branched gills, taken in the northern part of the Sound; not few however were new to the Danish fauna. On working out the material it was my aim, regarding the literature from the later years, to give as far as possible a general view of the distribution of the single species in our waters, which has, however, proved to be practicable merely in outlines, at any rate for the present.

It has not been possible to learn something certain about the behaviour of the different species to the hydrographical lines, viz. Darsserort-Gedser and Gniben-Djursland which was not to be ex-

pected either. On the other hand it is rather easily perceived that some forms are restricted almost exclusively to the North Sea and the Skagerrack, forms which are practically never to be found inside the Scaw; it will here, I believe, prove to be the question of rather stenohaline forms which require a relatively high amount of salinity of the water in which they live. Other species are found, which are indeed occurring in the North Sea and the Skagerrack, but at the same time enter the Kattegat reaching more or less southwards in this water. I have, as far as it was possible, tried to fix the approximate southerly limits for these species. Some are only to be found in the northern part of the Kattegat, others are proceeding until the southern part of this water and some few enter the Sound and the Belts. Finally there are species, which from the Kattegat pass through the Sound and the Belts and enter the Baltic with its low salinity, where they are to be found more or less easterly.

Only a few species enter the Baltic; according to the newly published list of Thulin 13 species in all, and of these none are endemic of this water. Of these thirteen species only five are represented in the material of the "Dana". It seems mostly to be euryhaline forms, some of which are euryhaline to such a degree, that they can be found practically anywhere in our waters without regard to the salinity if only the circumstances are otherwise suitable to them. Of such forms I shall here only name *Terebellides Stroemi* and presumably *Scoloplos armiger*. The same possibly also holds good for *Neoamphitrite figulus*. All of these three species are rather common in the Baltic; the *Terebellides Stroemi* is to be found as far easterly as the entrance of the Gulf of Finland.

On the following list are to be seen the stations of the "Dana" from which Polychæta are recorded. I have put down the different depths, bottom-temperature, salinity at the bottom and the nature of the bottom. I beg to thank on this occasion Dr. A. C. Johansen for the courtesy with which he placed at my disposal the journals of the "Dana" concerning the cruises in 1922—23. The material originating from other sources is not listed.

When examining this list, it will easily be observed, that there is a great difference among the various regions as regards the quantity of species of Polychæta. Some regions are very poor, others are to be pointed out as rich. Poor is for instance the Baltic; and if we look at the list of species for the stations from this water

separately, it will be seen that only very few species have been taken at each station, generally one, two, or maximally three. On the other hand, the same list shows from the stations of the eastern part of the Kattegat quite another amount. Thus the station 3014 has nineteen different species, st. 3045 has twelve, st. 3047 eighteen species, st. 3049 ten species. As reason for the species-poverty of the Baltic I think that everybody will refer to the low salinity of this water; but it does not seem that the amount of species is elsewhere increasing proportionally with the increasing of the salinity, at any rate not when considering a rather constricted region. The localities from where "Dana" has made its richest harvest of Polychæta are neither regions of the North Sea nor the Skagerrack but decidedly the above named stations of the eastern part of the Kattegat, localities as "*Groves Flak*", "*Fladen*", and other localities of that neighbourhood. Several of these stations present an amount of species exceeding the species-amount of the whole Baltic. Certainly there are stations of the eastern part of the Kattegat which have only contributed with a few species to the "Dana"-material, but, in this connection, it is a fact of no importance as factors not given in the list may have asserted themselves. The main point in this connection is that from certain regions viz. the Baltic, all the stations have a low amount of species, while in other regions several stations prove to have a high amount.

For the moment it is not easy to say for which reason the Eastern part of the Kattegat presents such an abundance of species as is presumably never met with in other marine districts of similar extent in Danish waters; I shall only point out, in this connection, that here a number of species occur which are not found elsewhere in Danish waters within the Scaw, but which occur partly in the North Sea or the Skagerrack and partly in the "Skärgård" of Sweden. Of such forms I shall here name *Nephthys rubella, Nephthys paradoxa, Aonides oxycephala, Pectinaria pusilla,* presumably also *Euchone rubrocincta;* a species, mentioned by Petersen (76) as characteristic for this area is also *Eumenia crassa,* which is, at any rate, going more southward in the Sound, where it is to be found until the Isle of "Hveen".

I am fully aware that in this connection it is necessary to take into consideration the implements which have been used for fishing, but as to the "Dana", on the cruises here dealt with, the trawl was almost exclusively employed excepting on behalf of some stations in the Baltic where Petersen's bottom-sampler was used.

List of stations of the “Dana“ 1922—23, from which Polychæta were recorded.

Station	Date	Position	Depth (Meters)	Bottom Temperature	Salinity at bottom	Nature of bottom	Species
2800	11.IX.22	54⁰ 15’ N. 1⁰ 15’ E.	52	12,32	34,58	Sand	Lepidonotus squamatus. Nereis pelagica. Flabelligera affinis. Polycirrus norvegicus.
2804	13.IX.22	55⁰ 16’ N. 5⁰ 39’ E.	45	14,75	34,54	Fine sand	Aphrodite aculeata.
2805	13.IX 22	55⁰ 18’ N. 6⁰ 07’ E.	44	14,81	34,52	Mixed bottom. Shells	Aphrodite aculeata. Hydroides norvegicus.
2809	14.IX.22	55⁰ 37’ N. 6⁰ 08’ E.	45	14,78		Fine sand. Shells	Harmothoe imbricata. Ophiodromus flexuosus.
2817	21.IX.22	55⁰ 27’ N. 7⁰ 15’ E.	30	14,38	33,12	Fine sand	Harmothoe antilopis. Chone infundibuliformis.
2828	25.IX 22	55⁰ 10’ N. 8⁰ 13’ E.	10	13,0	37,0	Sand. Partly coarse	Harmothoe imbricata.
2829	25.IX.22	55⁰ 10’ N. 7⁰ 55’ E.	19	13,0	31,7	Fine sand	Lumbrinereis gracilis.
2836	27.IX 22	55⁰ 32’ N. 8⁰ 06’ E.	15	12,85		Fine sand	Aphrodite aculeata.
2837	28.IX.22	56⁰ 44’ N. 7⁰ 57’ E.	28	12,5	34,1	Fine sand	Nephthys Hombergi. Nephthys longosetosa. Goniada maculata. Scoloplos armiger. Ophelia limacina. Chone Duneri.
2838	28.IX.22	56⁰ 41’ N. 8⁰ 07’ E.	18	13,0	34,2	Clay with stones	Gattyana cirrosa. Phyllodoce mucosa. Goniada maculata. Syllis armillaris.
2839	28.IX 22	56⁰ 49’ N. 7⁰ 45’ E.	36	12,3	34,5	Stones	Nereis pelagica. Syllis armillaris. Thelepus cincinnatus.
2840	28.IX.22	56⁰ 49’ N. 7⁰ 27’ E.	28	12,4	33,4	Small stones, gravel	Glycera capitata. Ophelia limacina.
2841	29.IX.22	56⁰ 59’ N. 7⁰ 41’ E.	22	12,45	33 8	Gravel	Nephthys longosetosa.
2842	29.IX.22	56⁰ 54’ N. 7⁰ 35’ E.	26	12,3	33,7	Gravel	Phyllodoce mucosa. Nephthys longosetosa. Lumbrinereis fragilis. Ophelia limacina. Notomastus latericius. Pectinaria belgica.
2843	29.IX.22	56⁰ 45’ N. 7⁰ 36’ E.	41	12,5	34,5	Sand. Stones	Nephthys longosetosa. Ophelia limacina. Lanice conchylega. Sabella pavonia. Pomatocerus triqueter.
2844	29.IX.22	56⁰ 40’ N. 7⁰ 51’ E.	26	12,85	34,5	Coarse gravel. Stones	Nereis pelagica. Pomatocerus triqueter.
2845	30.IX.22	56⁰ 31’ N. 8⁰ 03’ E.	18—22	12,6	33,6	Stones. Coarse gravel Clay	Phyllodoce mucosa. Nephthys longosetosa. Pectinaria belgica.
2846	30.IX.22	56⁰ 24’ N. 7⁰ 57’ E.	24	12,65	33,5	Gravel. Stones	Lanice conchylega.
2848	30.IX.22	56⁰ 25’ N. 7⁰ 43’ E.	27	13,3	33,6	Sand. Some stones	Harmothoe imbricata. Nephthys longosetosa. Lanice conchylega. Sabella pavonia
2850	1 X.22	56⁰ 32’ N. 6⁰ 44’ E.	37	13,55	34,8	Stones. Clay	Nereis pelagica. Lanice conchylega. Thelepus cincinnatus. Hydroides norvegica.
2851	1.X 22	56⁰ 41’ N. 6⁰ 32’ E.	37	13,55	34,8	Clay mixed with shells	Nephtbys Hombergi. Owenia fusiformis.
2852	1.X.22	56⁰ 49’ N. 6⁰ 32’ E.	48	10,6	34,7	Sand. Gravel. Shells	Onuphis conchylega. Syllis armillaris. [illegible]

2856	2.X.22	56° 52' N. 8° 02' E.	27	12,9	33,8	Gravel. Stones	Nereis pelagica. Syllis armillaris. Notomastus latericius. Dasychone Dalyelli. Pomatocerus triqueter.
2859	2.X.22	57° 05' N 8° 09' E.	34	13,0	34,6	Gravel. Small stones	Nephthys longosetosa.
2860	2.X.22	57° 12' N. 7° 52' E.	50	12,3	34,7	Small stones. Gravel	Aphrodite aculeata. Lepidonotus squamatus Nephthys ciliata. Eunice pennata. Nereis pelagica. Ephesia gracilis. Stylarioides plumosa. Ampharete Grubei. Thelepus cincinnatus. Sabella pavonia. Hydroides norvegica.
2864	3.X.22	57° 13' N. 8° 36' E.	22	12,85	33,9	Sm.stones. Gravel. Clay	Nephthys longosetosa.
2873	6.X.22	57° 21' N. 11° 03' E	8	11,5	26,6	Sand. Stones	Gattyana Amondseni. Eulalia viridis. Nereis pelagica. Pomatocerus triqueter.
2875	6.X.22	57° 10' N. 11° 41' E.	39	11,0	33,0	Sand. Shells	Onuphis conchylega. Pectinaria auricoma. Thelephus cincinnatus. Hydroides norvegica.
2880	7.X 22	57° 06' N. 11° 30' E.	33			Clay. Sand	Nephthys Hombergi. Glycera Goësi. Lumbrinereis fragilis. Goniada maculata. Aricia norvegica. Notomastus latericius. Amphicteis Gunneri.
2881	7.X 22	57° 05' N. 11° 32' E.	23	13,0	33,3	Sand. Stones. Shells	Nephthys rubella. Scoloplos armiger. Ophelia limacina Pectinaria auricoma. Pectinaria pusilla.
2884	8.X 22	57° 04' N. 10° 55' E.	9	11,2		Sand. Stones. Sea-weed	Harmothoe imbricata. Nereis pelagica. Aricia Cuvieri.
2889	10.X.22	$57^{0}37,_{5}'$ N. $11^{0}28,_{5}'$ E.	85	9,5	34,76	Mud	Glycera alba. Aonides oxycephala. Prionospio Steenstrupi. Chætozone setosa. Stylarioides glauca. Eumenia crassa. Pectinaria Koreni. Ampharete Grubei. Terebellides Stroemi.
2891	10 X.22	57° 24' N. 11° 10' E.	8	12,2	27,9	Sand. Stones	Harmothoe imbricata. Nereis pelagica. Ophelia limacina. Pectinaria auricoma. Pomatocerus triqueter.
2892	11.X.22	57° 48' N. 10° 45' E.	90	8,2	35,2	Mud	Ephesia gracilis.
2893	11.X.22	57° 55' N. 10° 47' E.	150	8,0	35,7	Mud	Aphrodite aculeata. Gattyana cirrosa. Harmothoe imbricata. Harmothoe Sarsi. Syllis armillaris. Ephesia gracilis.
2894	11.X.22	58° 15' N 10° 42' E.	230		35,12	Mud. Clay	Leanira tetragona. Hypereteone lactea. Nereis pelagica Nereis Dumerili. Pomatocerus triqueter.
2895	/12.X 22	58° 13' N. 9° 34' E.	650	5,10	35,14	Mud	Harmothoe Sarsi. Leanira tetragona.
2896	12.X 22	58° 06' N. 9° 35' E.	450	5,28	35,14	Mud	Leanira tetragona Melinna cristata.

Station	Date	Position	Depth (Meters)	Bottom Temperature	Salinity at bottom	Nature of bottom	Species
2897	12.X.22	58° 02' N. 9° 34' E.	340			Mud	Leanira tetragona. Goniada maculata. Goniada norvegica. Aricia norvegica. Paramphinome pulchella. Melinna cristata.
2898	12.X.22	57° 54' N. 9° 34' E.	100	7,58	35,16	Mud	Harmothoe Sarsi. Harmothoe antilopis. Gattyana cirrosa.
2902	13.X 22	57° 11' N. 8° 57' E.	15	11,04		Sand	Phyllodoce mucosa. Pectinaria belgica.
2904	13.X.22	57° 17' N. 8° 54' E.	23			Sand and stones	Harmothoe imbricata.
2905	13 X.22	57° 34' N 8° 50' E.	70			Sand. Shells	Scalisetosus communis. Nereis pelagica. Pectinaria Koreni. Pomatocerus triqueter. Hydroides norvegica.
2906	14.X.22	57° 41' N. 9° 04' E.	70	9,0	34,97	Mud	Aphrodite aculeata. Lepidonotus squamatus. Nephthys Hombergi. Glycera alba. Ammotrypane aulogaster. Eumenia crassa. Rhodine gracilior. Maldane Sarsi. Owenia fusiformis. Pectinaria auricoma. Pectinaria belgica. Ampharete Grubei. Terebellides Stroemi. Lanice conchylega. Thelepus cincinnatus.
2907	14.X 22	57° 35' N. 9° 00' E	45			Sand	Aphrodite aculeata. Nephthys Hombergi. Glycera alba. Lumbrinereis gracilis. Ophiodromus flexuosus. Cirratulus tentaculatus. Ammotrypane aulogaster. Stylarioides glauca. Enclymene droebachiensis. Owenia fusiformis. Pectinaria auricoma. Thelepus cincinnatus. Hydroides norvegica.
2908	14.X.22	57° 35' N. 9° 04' E.	35	11,95		Sand. Shells	Thelepus cinninnatus.
2909	14.X.22	57° 41' N. 10° 03' E.	18	11,3		Sand	Nephthys Hombergi.
2912	15.X.22	57° 43' N. 10° 22' E	25	11,2		Stones. Shells	Lepidonotus squamatus.
2913	15.X.22	57° 40' N. 10° 34' E.	14	12,45		Sand	Nereis pelagica.
2915	15 X.22	57° 35' N. 10° 28' E.	8	11,7		Sand	Nereis Dumerili.
2918	17.X.22	57° 08' N. 10° 39' E.	10			Sand. Small stones	Nereis Dumerili.
2922	18 X.22	57° 07' N. 11° 43' E.	30			Stones. Shells	Gattyana cirrosa. Nereis Dumerili.
2944	17.IV.23	56° 25' N. 12° 40' E.	18	6,5	34,94		Nephthys ciliata. Nereis pelagica.
2946	17 IV.23	56° 17' N. 11° 51' E	27	5,3	33,33		Nereis pelagica,
2948	18.IV.23	56° 11' N. 12° 09' E.	21	5,0	32,34	Sand and stones	Nereis pelagica.
2954	19.IV.23	55° 26,5' N. 12° 28' E.	14	4,4	14,90		
2955	19 IV.23	55° 16' N. 12° 32' E.	20	4,6	12,76	Mixed bottom	[illegible]

							lior. Pectinaria Koreni. Neoamphitrite figulus. Neoamphitrite Grayi. Artacama proboscidea.
2966	21.IV.23	54° 47' N. 10° 26' E.	26	6,1	12,88		Harmothoe imbricata. Nephthys ciliata.
2971	23.IV.23	54° 50' N. 10° 14' E.	33	3,2	24,60	Mud	Nephthys ciliata.
2973	23 IV.23	54° 42' N. 10° 17' E.	21	4,1	13,42		Harmothoe Sarsi. Nephthys cocea. Nereis pelagica.
2974	24.IV.23	54° 56' N. 10° 52,$_5$' E	26	4,5	29,05		Harmathoe imbricata. Nereis pelagica. Nereis Dumerili. Thelepus cincinnatus. Spirorbis borealis.
2980	25.IV.23	56° 21' N. 11° 15' E.	22	5,8	33,77		Nephthys ciliata.
2987	28 IV.23	57°35,$_5$'N. 10°28,$_5$'E.	6	6,5	34,09		Phyllodoce mucosa.
3000	1.V.23	57° 07' N. 8° 46' E.	7	5,7	33,8		Eumida sanguinea. Nereis pelagica. Lanice conchylega Nicolea zostericola.
3007	5 V.23	55° 10' N. 7° 05' E.	33	5,1	33,2		Ammotrypane aulogaster.
3014	7.V.23	57° 28' N. 7° 30' E.	135	5,2		Mud	Aphrodite aculeata. Hypereteone lactea Nephthys Hombergi. Nephthys paradoxa. Glycera Goësi. Glycera alba. Goniada maculata. Goniada norvegica. Lumbrinereis fragilis. Ammotrypone aulogaster. Nicomache lumbricalis, var. borealis. Rhodine gracilior. Isocirrus planiceps. Praxilella affinis. Asychis biceps. Pectinaria auricoma. Amphicteis Gunneri. Samytha sexcirrata. Sabella pavonia.
3015	7.V.23	57° 24' N. 8° 13' E.	70	5,7	32,4		Nereis pelagica. Thelepus cincinnatus. Pomatocerus triqueter. Hydroides norvegica.
3036	13.V.23	56° 58' N. 10° 25' E.	7	8,5	27,4	Sand	Harmothoe imbricata. Lysidonotus squamatus. Phyllodoce maculata. Nephthys Hombergi.
3041	15.V.23	57° 48' N. 10° 42' E.	85		29,7		Goniada maculata. Stylarioides glauca. Owenia fusiformis.
3042	15.V.23	57° 53' N. 10° 33' E.	130	5,3	34,79		Leanira tetragona. Aricia norvegica. Ammotrypane aulogaster. Melinna cristata.
3043	16.V.23	58° 19' N. 9° 37' E.	400-600	5,3	35,10	Mud and clay	Lætmonice filicornis. Leanira tetragona. Aphrodite aculeata. Nephthys Hombergi Lumbrinereis gracilis. Aricia norvegica. Ammotrypane aulogaster. Terebellides Stroemi.

Station	Date	Position	Depth (Meters)	Bottom Temperature	Salinity at bottom	Nature of bottom	Species
3045	17.V.23	57° 28' N. 11° 25' E.	25—35				Lepidonotus squamatus. Notophyllum foliosum. Phyllodoce maculata. Nephthys Hombergi. Glycera Goësi. Glycera alba. Ophiodromus flexuosus. Ammotrypane aulogaster. Owenia fusiformis. Pectinaria auricoma Amage auricola. Terebellides Stroemi.
3047	17.V.23	57° 26,5' N. 11° 23' E.	65	6,0	33,80	Clay and mud	Aphrodite oculeata Nephthys Hombergi. Nephthys paradoxa. Nephthys rubella. Glycera Goësi. Glycera alba. Goniada maculata. Ophiodromus flexuosus. Ophelia limacina. Eumenia crassa. Nicomache lumbricalis, var. borealis. Rhodine gracilior. Owenia fusiformis. Pectinaria auricoma. Pectinaria belgica. Lanice conchylega. Thelepus cincinnatus. Sabella pavonia.
3048	17.V.23	57° 07' N. 11° 28' E.	80	6,2	34,67	Mud	Panthalis Oerstedi. Nephthys paradoxa. Glycera alba Goniada maculata. Lumbrinereis fragilis. Ammotrypone aulogaster. Pectinaria belgica.
3049	17.V.23	57° 06' N. 11° 35' E.	25			Sand and gravel	Nephthys rubella. Glycera alba. Goniada maculata. Ophelia limacina. Travisia Forbesi. Ammotrypane aulogaster. Owenia fusiformis. Pectinaria auricoma. Pectinaria pusilla. Euchone rubrocincta.
3053	19.V.23	56° 08' N. 12° 24' E.	26			Clay	Phyllodoce mucosa. Nephthys ciliata. Glycera alba. Glycera sp. Ophiodromus flexuosus. Ammotrypane aulogaster. Eumenia crassa. Pectinaria belgica.
3054	19.V.23	56° 06,5' N. 12° 35' E.	30	6,6	36,61	Mud and shells	Nephthys ciliata. Lumbrinereis fragilis. Nicomache lumbricalis, var. borealis. Amphicteis Gunneri. Terebellides Stroemi.
3057	29.V.23	56° 34' N. 12° 12' E.	40	6,4	34,47		Eumenia crassa.
3060	30.V.23	55° 51' N. 10° 49' E.	49	6,6	33,86		Nephthys ciliata.
3075	4.VI.23	54° 52' N. 9° 48' E.	25	5,1	21,42		Harmothoe glabra.
3081	5.VI 23	54° 25' N. 12° 10' E.	26	6,2	20,59	Grayish mud and clay	Harmothoe Sarsi. Nephthys ciliata. Terebellides

							bellides Stroemi.
3087	7.VI.23	54° 49' N. 12° 15,$_5$' E.	17	9,1		Sand and gravel	Scoloplos armiger.
3088	7.VI 23	54° 47' N 12° 31' E.	19	7,4		Sand	Harmothoe imbricata. Harmothoe Sarsi.
3089	7.VI.23	54° 55' N. 12° 28' E.	22	6,5	20,34	Fine sand	Harmothoe Sarsi. Travisia Forbesi.
3090	7.VI 23	54° 54' N. 12° 32' E	34	6,7	22,11	Mud and clay	Nephthys ciliata.
3091	8 VI 23	55° 04,$_5$ N. 12° 28,$_5$ E.	13	10,4	8,03	Sand	Harmothoe Sa:si. Travisia Forbesi.
3094	8.VI.23	55° 10,$_5$ N. 12° 29' E.	19	7,1		Sand and stones	Harmothoe Sarsi.
3098	9.VI.23	54° 53' N. 13° 25' E.	45	7,7	15,82	Dark clay	Nephthys ciliata. Terebellides Stroemi.
3103	13.VI.23	55° 28' N. 14° 49' E.	73	4,25	15,99	Mud with stones	Scoloplos armiger.
3104	13.VI.23	55° 22' N. 14° 38' E.	40	4,8	11,22	Mud with stones and shells	Harmothoe Sarsi.
3105	13 VI.23	55° 21' N. 14° 42,$_5$' E.	53			Coarse gravel and black mud	Neoamphitrite figulus.
3106	14.VI.23	55° 29' N. 15° 02' E.	80	5,4	15,64		Scoloplos armiger.
3107	14.VI.23	55° 29' N. 15° 17' E.	78	4,2	15,44	Clay and mud	Scoloplos armiger.
3111	15.VI 23	55° 07' N. 15° 30' E.	95	4,05	16,51	Clay. Gravel. Stones	
3113	16.VI.23	55° 01' N. 15° 11' E.	21	6,3	7,79	Clay-slate	Harmothoe Sarsi.
3115	18.VI.23	55° 15,$_5$' N. 14° 33' E.	50	6,3	14,72		Harmothoe Sarsi. Neoamphitrite figulus
3119	19.VI.23	55° 08' N. 16° 08' E.	85	4,1	16,71	Gray mud	Nephthys ciliata. Scoloplos armiger.
3120	19.VI.23	55° 11' N. 15° 47' E.	88	4,2	15,10	Clay	Harmothoe Sarsi.
3123	20.VI 23	54° 56,$_5$ N. 14° 53' E.	35	3,2	8,13	Sand and clay	
3126	21.VI 23	55° 01' N. 14° 01' E.	49	6,5	16,67	Dark mud	Scoloplos armiger.
3127	21.VI 23	54° 53' N. 13° 43' E.	50	9,2	14,81	Clay	Nephthys ciliata. Scoloplos armiger. Terebellides Stroemi.
3128	21.VI.23	54° 42' N. 13° 33' E	37	9,1	13,10	Fine dark mud	Scoloplos armiger. Terebellides Stroemi.
3129	22.VI.23	54° 53' N. 13° 25' E.	46	9,4	15,84	Mud	Scoloplos armiger. Terebellides Stroemi.
3130	22.VI 23	55° 05' N. 13° 23' E.	46	9,2	16,89	Sand mixed with clay	Scoloplos armiger. Terebellides Stroemi.
3131	22 VI.23	55° 06' N. 13° 09' E.	27			Sand	Terebellides Stroemi.
3132	22.VI.23	55° 08' N. 13° 13' E.	38	11,0	8,92	Clay	Travisia Forbesi. Terebellides Stroemi.
3133	22.VI.23	55° 03' N. 13° 05' E.	19	9,9	8,68	Sand and stones	Harmothoe Sarsi.
3134	22 VI.23	54° 56,$_5$' N. 12° 50' E.	29	9,6		Sand mixed with clay	Scoloplos armiger.
3135	22.VI.23	54° 54' N. 12° 33' E.	25				Scoloplos armiger. Terebellides Stroemi.
3137	23.VI.23	54° 50' N. 12° 22' E.	21	10,0		Sand and mud	Scoloplos armiger.
3140	23.VI 23	54° 50' N. 12° 49' E.	20	10,2	15,88	Sand	Scoloplos armiger.
3141	23.VI.23	57° 53' N 12° 55' E.	24	9,8	14,00	Sand	Travisia Forbesi.
3199		55° 10' N. 10° 58' E.		15,8	14,7	Clean sand	Harmothoe Sarsi.

Aphroditidæ

Lætmonice filicornis Kinberg.

"Dana" St. 3043. One specimen.

Only one, rather small specimen is present. It was taken 45 sea-miles N. 1/4 W. of Hirtshals light-house, at a depth of 400—600 m.

In the deeper parts of the Skagerrack this species seems to be rather common; at any rate several specimens are found in our museum, originating from localities at a depth of 500—700 m; but in the Danish waters within the Scaw it is practically lacking. Only one specimen is known to have been taken here — a specimen from Hornbæk, which Ørsted mentions in his Annulat. Dan. consp. p. 11. (74).

Aphrodite aculeata L.

"Dana" St. 2804, 1 spec. St. 2805, 3 spec. St. 2836, 1 spec. St. 2860, 1 spec. St. 2893, 3 spec. St. 2906, 1 spec. St. 2907, 3 spec. St. 3014, 3 spec. Stat. 3043, 1 spec. Stat. 3047, 2 spec.

The specimens at hand all originate from localities where this species is previously known to be common, viz. the North Sea, the Skagerrack and the Kattegat. No material is present that can contribute to the knowledge of its distribution southwards. In the Sound this species seems to have its southern limit SW. of Landskrona A. Eliason (30).

The largest specimen present measures 130 mm in length and was taken 11 sea-miles S. t. W. of Lyngvig light-house at a depth of 15 m.

Polynoidæ

Harmothoe imbricata L.

"Dana" St. 2809. St. 2848. St. 2884. St. 2891. St. 2893. St. 2904. St. 2966. St. 2974. St. 3036. St. 3086. St. 3088.

Several specimens are present from each of the named localities.

Harmothoe impar Johnst.

"Dana" St. 2854. One specimen.

Harmothoe Sarsi Malmgren.

"Dana" St. 2893, 2 spec. St. 2895, 1 spec. St. 2898, 1 spec.

St. 2973, 1 spec. St. 3081, 1 spec. St. 3085, 1 spec. St. 3088, 7 spec. St. 3089, 2 spec. St. 3091, 1 spec. St. 3094, 3 spec. St. 3104, 6 spec. St. 3113, 1 spec. St. 3115, 1 spec. Stat. 3120, 1 spec. St. 3133, 1 spec. St. 3199, 1 Spec.

In the Danish waters this species is mainly confined to the Baltic, where it is exceedingly common, but it is sparcely spread over the Belts, the Kattegat and the Skagerrack. The specimens from the Baltic are on an average larger than those originating from other Danish localities.

Harmothoe glabra Mgrn.

"Dana" St. 3075, 1 spec.

As far as I am aware, only one specimen of this species has hitherto been recorded from Danish waters. It was taken by "Pommerania" in the Great Belt and is mentioned by Levinsen in "Hauch's Togter" (57).

It was taken now and then in the belt of rocks and islands on the western coast of Sweden (Bohuslän), but it seems to be scarce also here.

Harmothoe antilopis McIntosh.

"Dana" St. 2817, 1 spec. St. 2898, 2 spec.

The first find of this species in Danish waters was mentioned in 1917 from "The Danish Ingolf Expedition", the only specimen hitherto taken within the Scaw. It was captured by the present author N.E. of Frederikshavn at a depth of 36 m on soft bottom.

The species is widely distributed but does not seem to be common anywhere.

Gattyana cirrosa Pall.

"Dana" St. 2838, 2 spec. St. 2893, 1 spec. St. 2898, 4 spec. St. 2922, 1 spec.

This species is exceedingly commom within the Scaw. According to its occurrence in the Sound Eliason writes: "Die Art ist neben Harmothoe imbricata die allgemeinste Polynoide des Öresunds."

Gattyana Amondseni Mgrn.

"Dana" St. 2873, 2 spec.

This species was described by Malmgren in 1867 from Godhavn in Greenland and was later on recorded from N. America. The Ingolf Expedition has taken it at the Westman-islands and Bidenkap states it to have been taken by M. Sars in Kristianiafjord at Drøbak and in the Trondhjemsfjord by Storm.

The species is new to the Danish fauna.

Halosydna gelatinosa Sars.

Halosydna gelatinosa was hitherto not recorded from Danish waters. The only specimen present was taken ten miles South-West of Hesselø at a depth of 20 m on gravel by Dr. Blegvad the 20th of May 1912.

The species seems to be widely distributed at Atlantic coasts. It was originally described by M. Sars from Norway; Malmgren states it from the coasts of Bohuslän, Lovén from Lysekil. Further it is known from British and French costs, from Maroc and from Madeira.

Lepidonotus squamatus L.

"Dana" St. 2800, 5 spec. St. 2860, 3 spec. St. 2908, 1 spec. St. 2912, 2 spec. St. 3036, 1 spec. St. 3045, 1 spec.

It is common everywhere in Kattegat and the Belts on suitable bottom, mainly on shell-ground. It has a wide range at Atlantic coasts and also occurs in Japan Izuka (49).

Enipo Kinbergi Malmgren.

This species was not recorded by the "Dana". During later years it has proved not to be scarce in the deeper parts of the Kattegat. It was taken by Dr. Mortensen in the deep channel between Frederikshavn and Nordre Rønner at a depth of 20 fathoms in August 1905. Another specimen was secured West of Refsnæs on 48 m the 9th of May 1912 by the Biol. Station steamer "Sallingsund" and kindly forwarded to our museum by Dr. Blegvad. Further it was taken in Læsø Rende, 5 miles NW. of "Nordre Rønner", 38—41 m, the 30th of August 1912, and further it has been taken sometimes by the investigation-steamer "Sallingsund".

According to C. G. Johs. Petersen (76) the species was

taken in the "Great Belt", E. of Knudshoved, 22—25 m, on gravel with coarse detritus 23.V.1911, and Eliason (30) mentions it from the Sound.

Scalisetosus communis delle Ch.

"Dana" St. 2905, one spec.

The species which does not seem to be scarce in the Skagerrack and the Atlantic is hitherto not known to have been taken within the Scaw.

Sigalionidæ

Sigalion Mathildæ Aud. & Edw.

While this species does not occur in the material of the "Dana", it was taken in the Kattegat, 3 miles E. t. N. of Frederikshavn at a depth of 21 m the 31th of August 1912 by the present author. Only one specimen was secured.

Leanira tetragona Örsted.

"Dana" St. 2894. St. 2895. St. 2896. St. 2897. St. 3042. St. 3043.

Some few specimens are present from each of the named localities, at most three or four. The species seems to be very scarce within the Scaw; Levinsen (55) notices one from the Kattegat and Eliason (30) a fragment from the northern part of the Sound. Petersen (76) notices one specimen from the Kattegat, East of "Læsø", 22 m, 28.VII.1912.

Sthenelais limicola Ehlers.

"Dana" St. 2893, 1 sp. St. 2898, 1 sp. St. 2907, 4 sp.

The species does not seem to have been recorded from within the Scaw.

Acoëtidæ

Panthalis Oerstedi Kinberg.

"Dana" St. 3048.

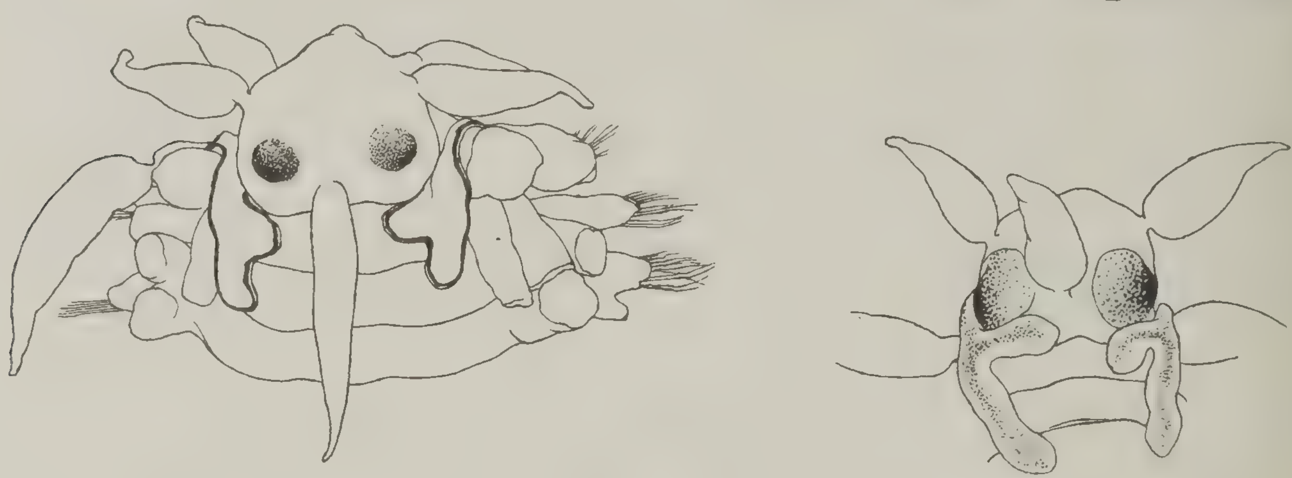
Fragments of two specimens are at hand.

Phyllodocidæ

Notophyllum foliosum M. Sars.

"Dana" St. 3045, one specimen.

On the only specimen present it appears by closer examination that the nuchal organ consists of two rather long and slender flabs, each distally somewhat expanded and ending in two short branches, and thus somewhat differing from the common apprehension of the shape of this organ in the species under consideration. Thus Bergstrøm (9) in his compendious paper dealing with the systematism of Phyllodocids simply writes that the nuchal organ "ungeteilt ist".



1. 2.

Fig. 1. *Notophyllum foliosum* M. Sars. The cephalic lobe and first segments of the specimen taken by the "Dana". — Fig. 2. *Notophyllum foliosum* M. Sars. The cephalic lobe and first segments of a specimen originating from the Fjord of Trondhjem.

I therefore believed that I had to do with a new species until I found that Marenzeller in his paper "Polychæten des Grundes" (62) has figured the head with protruded nuchal flabs of a specimen of Notophyllum foliosum, very much like that found in the specimen taken by the "Dana", only more extreme in shape, the organ being more distinctly divided into two branches. In the text Marenzeller remarks that "eine solche Verdoppelung scheint nicht vereinzelt aufzutreten, da ich ihre ersten Anfänge ebenso an einem Tiere aus dem atlantischen Ocean beobachtete." After having read this I undertook an examination of all the specimens present in our museum of the species under consideration, including several Danish specimens as well as Norwegian, and found that not few of them had branched nuchal organs and that the named organ was varying rather considerably as to shape and size. The most

extreme specimen originating from Trondhjem Fjord is seen in fig. 2, while fig. 1 shows the specimen taken by the "Dana".

The species seems to be rather common in the Kattegat. Three specimens originate from the Northern part of the Sound, namely two from Hellebæk, one taken by Jungersen and the other by P. Müller; and one off Aalsgaarde. I call special attention to this fact because Eliason does not mention the species from the Sound.

Phyllodoce mucosa Örsted.

"Dana" St. 2838, 1 spec. St. 2842, 2 spec. St. 2845, 5 spec. St. 2902, 1 spec. St. 2987, 2 spec. St. 3053, 1 spec.

This species seems to be common in Danish waters outside as well as inside the Scaw. The "Dana" has taken it in the North Sea and the Skagerrack and in the Northern part of the Sound.

Phyllodoce maculata L.

"Dana" St. 3036, 1 specimen. St. 3045, 1 specimen.

Eumida sanguinea Ørsted.

"Dana" St. 3000, 1 spec.

Eulalia viridis O. F. M.

"Dana" St. 2873, 1 spec.

Hypereteone lactea Clpd.

"Dana" st. 2894, 2 spec. St. 3014, 1 spec.

This species recently recorded for the first time from Danish waters by Eliason was taken by the "Dana" at two stations in the Skagerrack. Already in 1914 Bergstrøm wrote that "sehr wahrscheinlich kommt die Art auch an der atlantischen Küste Dänemarks sowie in Öresund und den Belten, möglicherweise auch in der Ostsee vor." — After the captures in the Skagerrack I do not consider it very probable that the species should be found in the Baltic.

Nephthydæ

Nephthys ciliata O. F. M.

"Dana" St. 2860. St. 2944. St. 2960. St. 2963. St. 2966. St. 2971. St. 2980. St. 3053. St. 3054. St. 3060. St. 3081. St. 3086. St. 3090. St. 3098. St. 3119. St. 3127.

This species is one of our most common Polychæta. From each of the named stations it is present in a different number of specimens.

Nephthys coeca Fabr.

"Dana" St. 2973, 3 spec. St. 2963, 1 spec.

This species is not by far so common in Danish waters as the preceding one but it occurs anywhere within the Scaw also in the Baltic. Heinen (46).

Nephthys Hombergi Aud. & Edw.

"Dana" St. 2837, 3 spec. St. 2851, 1 spec. St. 2880, 3 spec. St. 2906, 1 spec. St. 2907, 4 spec. St. 2909, 1 spec. St. 3014, 1 spec. St. 3036, 1 spec. St. 3043, 1 spec. St. 3045, 4 spec. St. 3047, 1 sp.

The species is widely distributed in Danish waters but is, according to Eliason, not to be found in the Sound. The specimens taken by "Dana" originate partly from the Kattegat, partly from the North Sea and the Skagerrack.

Nephthys paradoxa Malm.

"Dana" St. 3014, 1 spec. St. 3047, 1 spec. St. 3048, 5 spec.

N. paradoxa seems to be common nowhere, but it was taken several times in the Kattegat. It does not seem to enter the Sound or the Belts.

Nephthys longosetosa Örsted.

"Dana" St. 2837, 1 spec. St. 2841, 5 spec. St. 2842, 3 spec. St. 2843, 2 spec. St. 2845, 2 spec. St. 2848, 1 spec. St. 2859, 3 spec. St. 2864, 1 spec.

All the specimens taken by the "Dana" originate from the North Sea and the Skagerrack where the species seems to be rather common.

Nephthys rubella Michaelsen.

"Dana" St. 3047, 1 sp. St. 3049, 4 spec. St. 2881, 2 spec.

As far as I am aware, the species was hitherto only taken in the North Sea. The specimens taken by the "Dana" all originate from the Kattegat. In 1912 the first Danish specimens were secured by Dr. Blegvad who got two at "Groves Flak" and "Fladen". The "Dana"-specimens originate from about the same region in the Eastern part of the Kattegat.

Glyceridæ

Glycera Goësi Malmgren.

"Dana" St. 3014, 1 spec. St. 3045, 1 spec. St. 3047 3 spec. St. 2880, 1 spec.

The finds brought home by the "Dana" prove that this species is not uncommon in the deeper parts of the Kattegat. It does not seem to enter the Belts or the Sound; at any rate, Eliason did not meet with it in his great material of Polychæta from the Sound.

Glycera alba Rthke.

"Dana" St. 2889, 5 spec. St. 2906, 1 sp. St. 2907, 1 spec. St. 3014, 1 sp. St. 3045, 3 spec. St. 3047, 2 spec. St. 3048, 3 spec. St. 3049, 6 spec. St. 3053, 1 spec.

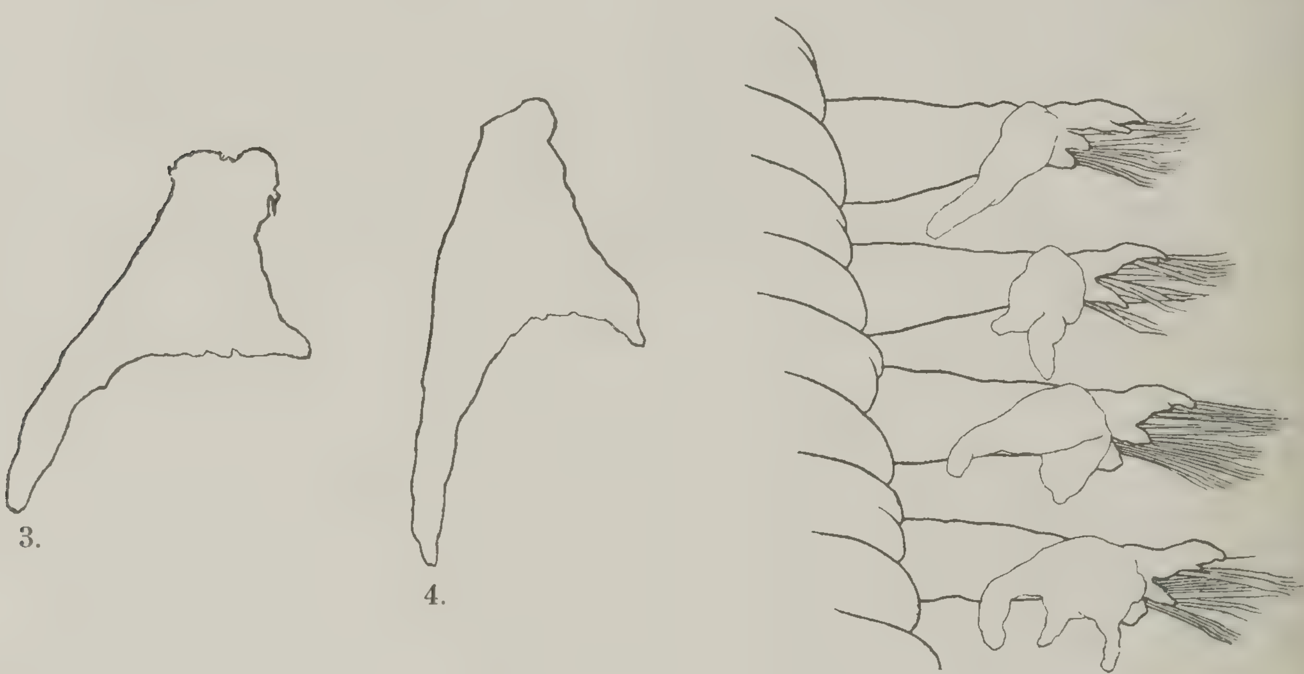
This species seems to be very common in Danish waters, in the North Sea and the Skagerrack as well as within the Scaw. It is not known from the Baltic.

Glycera sp.

"Dana" St. 3053.

In the northern part of the Sound, off Hornbæk, was captured a fragment of a specimem of a Glycera which is provided with retractile, branched gills. Only the foremost half of the animal is present and this half measures 24 mm in length. The width of

the animal is, with the parapodes, nearly 5 mm — bristles not counted. Considering that only a fragment is present and that the specimen is in very bad condition an exhaustive description is not well possible, but I do not think that this fact is of much importance as I am inclined to mean that the specimen is not a representative for a nova species but merely a monstruosity of *G. alba.* A closer examination of the parapode proves that the only difference wich can be pointed out here is that in the noımal G. alba the gills are digitiform, while in the specimen



3.

4.

5.

Fig. 3. *Glycera sp.* Wing of one of the jaws. — Fig. 4. *Glycera alba* Rthke. Wing of a jaw. — Fig. 5. *Glycera sp.* Four segments showing branched gills.

under consideration they are irregularly branched. Fig. 6 shows a parapode viewed from behind. The type of the Glycera alba-foot is easily recognizable. The two large anterior lobes are seen as well as the two posterior of which the ventral is short and rounded; the dorsal cirrus which is almost globular is situated at the base of the parapode, still somewhat elevated. Only the gill differs considerably being provided with several branches and irregular outgrowths. Fig. 7 shows a fragment of another parapode with its gill which is divided in three branches almost equal in size, and one of which has a little, filiform appendix. Finally fig. 5 shows a part of the specimen with four parapodes, drawn at low power under the binocular microscope; in this figure it is plainly seen

how different and irregularly varying the gills of the different parapodes really are. The examination also proves the wing (ailleron, Fauvel) from one of the jaws (fig. 3) to be agreeing rather well with the shape usual in G. alba (fig. 4). Also the papillæ of the pharynx seem to agree in shape with the wellknown feature in G. alba, but I must confess that the examination of these did not yield any absolutely reliable result, on account of the somewhat macerated condition of the named organ.

As to the division of the gills into branches I must add that I

7.

6.

Fig. 6. *Glycera sp.* Parapod with gill. — Fig. 7. *Glycera sp.* Another parapod with gill.

have examined all our Danish material of the species under consideration, especially that from the Sound, but I have in no other specimen found any gill provided with branches or outgrowths, nor have I observed any tendency to ramification.

Glycera capitata Ørsted.

"Dana" St. 2840.

Only two specimens were captured, both of them originating from the same locality in the North Sea.

Goniada maculata Ørsted.

"Dana" St. 2837, 1 spec. St. 2838, 1 spec. St. 2880, 2 spec. St. 2897, 1 spec. St. 3014, 1 spec. St. 3041, 1 spec. Stat. 3047, 5 spec. St. 3048, 1 spec. St. 3049, 2 spec.

The species is very common in Danish waters save the Baltic. It does not seem to enter the southern parts of the Sound and the Belts.

Goniada norvegica Ørsted.

"Dana" St. 2897, 1 spec. St. 3014, 2 spec.

This species does not seem to occur within the Scaw; the specimens taken by the "Dana" are all fragments of rather large individuals. As far as I am aware, the specimens are the first known to have been taken in Danish waters.

Eunicidæ

Lumbriconereis fragilis O. F. M.

"Dana" St. 2842, 2 spec. St. 2880, 1 spec. St. 3014, 7 spec. St. 3048, 1 spec. St. 3054, 2 spec.

This species is one of our most common Polychaetes and seems to occur all over the Kattegat as well as the Sound and the Belts. It was, as far as I am aware, hitherto not found in the Baltic. As to the question whether L. minuta Théel is only a juvenile stage of L. fragilis or is to be considered as an independent species — a question, which Eliason discusses in his important paper dealing with the Polychæta of the Sound, I shall only remark that this is more easily settled through investigation in a marine laboratory than in a museum with only dead material at one's disposal.

Lumbriconereis gracilis Ehlers.

"Dana" St. 2829, 1 spec. St. 2907, 1 spec. St. 3043, 9 spec.

This species is to be considered as new to our fauna inasmuch as it has not formerly been found so near to our coasts; but it has been recorded from the adjacent waters. It has a wide range, and was first known from Fiume in the Mediterranean.

Eunice pennata O. F. M.

Leodice norvegica Malmgren 1867, p. 64.

"Dana" St. 2860.

Of this, in Danish waters rather scarce form, only one specimen was secured, namely from the Skagerrack. The only record of it from within the Scaw is — as far as I am aware — that of Möller from the Sound N. of Hveen which Levinsen mentions in his paper dealing with "Hauch"s cruises. In the abundant material from the Sound at the disposal of Eliason it was not found.

Onuphis conchyllega Sars.

"Dana" St. 2852, 18 spec. St. 2875, 5 spec.

The species is rather common in the North Sea and in the Skagerrack, but it is not known to enter the Kattegat.

Nereidæ

Nereis pelagica L.

"Dana" St. 2800, 4 spec. St. 2839, 4 spec. St. 2844, 1 spec. St. 2850, 1 spec. St. 2854, 1 spec. St. 2856, 1 spec. St. 2860, 4 spec. St. 2873, 1 spec. St. 2884, 3 spec. St. 2891, 1 spec. St. 2894, 1 spec. St. 2905, 3 spec. St. 2944, 4 spec. St. 2946, 1 spec. St. 2948, 1 spec. St. 2963, 1 spec. St. 2973, 1 spec. St. 2974, 2 spec. St. 3000, 1 spec. St. 3015, 2 spec. St. 3084, 2 spec.

Exceedingly common in Danish waters; it enters the southwestern part of the Baltic.

Nereis Dumerili Aud. & Edw.

"Dana" St. 2894, 1 spec. St. 2915, 1 spec. St. 2918, 1 spec. St. 2922, 2 spec. St. 2974, 7 spec.

Most of the captures originates from northern parts of our waters. Only one find was made in the Belts, namely at St. 2974, 1 sea-mile E.S.E. of Spodsbjærg-bridge, where seven specimens were secured. As stated by Eliason this species does not seem to endure water of low salinity and consequently does not enter the Baltic.

Hesionidæ

Ophiodromus flexuosus delle Chiaje.

"Dana St. 2809, 18 spec. St. 2907, 1 spec. St. 3045, 1 spec. St. 3047, 4 spec. St. 3053, 1 spec.

The most southern find of this species is that from St. 3053, off Hornbæk, where one specimen was taken. I mention this because it seems to be scarce in the Sound. Eliason states it to have been taken South of Hveen.

The specimen taken by the "Dana" have bristles with bifid tips and agree rather well with the figures of Claparède just like those examined by Eliason. I therefore refer the specimens to *O. flexuosus* delle Chiaje.

Syllidæ

Syllis armillaris O. F. M.

"Dana" St. 2852, 1 spec. St. 2838, 1 spec. St. 2839, 4 spec. St. 2856, 14 spec. St. 2893, 3 spec.

The "Dana" has only taken this species outside the Scaw; but it is known not to be scarce in the Kattegat. It enters the Belts, and in the Sound it has been taken at Hellebæk by Lütken (fide Levinsen).

Sphærodoridæ

Ephesia gracilis Rathke.

"Dana" St. 2860, 5 spec. St. 2892, 1 spec. St. 2893, 4 spec.

All the specimens taken by the "Dana" originate from the North Sea and the Skagerrack, but the species is also to be found inside the Scaw. After Eliason it enters the Sound, but only once it has been met with in the southern part of this water.

Spionidæ

Aonides oxycephala (Sars).

"Dana" St. 2889, 2 spec.

The two specimens were taken in the Kattegat not far from the coast of Sweden, at the lighthouse of Vinga. As far as I am

aware it is the only find of this species known from within the Scaw. The species under consideration must be noted as new to the Danish fauna.

Prionospio Steenstrupi Mgrn.

"Dana" St. 2889, 1 spec.

Only one specimen was secured by the "Dana", originating from the same locality as the preceding species.

Magelonidæ

Magelona papillicornis (O. F. M.).

Samsø belt. East of "Pughavn". 4 m. 24.VI.12. Blegvad. 2 spec.

In 1920 the genus under consideration was stated to belong to the Danish fauna as Eliason mentions M. rosea Moore as taken in the South-Eastern part of the Kattegat.

It is quite interesting that the two specimens at my disposal and originating from the western part of the Kattegat, belong to M. papillicornis. The bristles of the ninth setigerous segment thus terminate in a bulbous tip and are in shape perfectly agreeing with the figures of McIntosh from 1878 (65). The two specimens are put down on the list from the Danish Biological station (76) p. 25 as Spionidæ.

Disomatidæ

Disoma multisetosum Ørsted.

Nyborg Fjord. 27.VIII.1920. Blegvad. 4 spec.

As the distribution of this interresting form is very little known I notice here the find from the area of the Great Belt. It is besides not astonishing that the species enters a water the salinity of which is so low as that of Nyborg Fjord, as it has been recorded from the western parts of the Baltic.

Cirratulidæ

Cirratulus tentaculatus Mont.

"Dana" St. 2907, 1 spec.

In 1874 Malm recorded this species from Gulmarn (Sweden) but as far as I am aware it was never found in Danish waters before. The specimen at my disposal originates from the Skagerrack.

Chætozone setosa Mgrn.

"Dana" St. 2889, 1 spec.

The species is widely distributed in Danish waters. In the Sound it has been recorded sometimes south of Hveen, but it seems to be scarce so far southwards.

Ariciidæ

Scoloplos armiger (O. F. M.).

"Dana" St. 2837, 1 spec. St. 2881, 1 spec. St. 3087, 3 spec. St. 3103, 3 spec. St. 3119, 3 spec. St. 3106, 6 spec. St. 3107, 2 spec. St. 3126, 2 spec. St. 3127, 1 spec. St. 3128, 58 spec. St. 3129, 2 spec. St. 3130, 6 spec. St. 3134, 3 spec. St. 3135, c. 22 spec. St. 3137, c. 10 spec. St. 3140, 4 spec.

This species, one of the most common of our Polychæta seems to be very euryhaline; it is widely distributed in the Baltic and seems to be found everywhere in Danish waters where suitable localities are found; it is mainly restricted to sandy bottom and to sand mixed with mud.

Aricia cuvieri Aud. & Edw.

"Dana" St. 2884.

The only specimen originates from the northern part of the Kattegat. It seems to be scarce within the Scaw.

Aricia norvegica M. Sars.

"Dana" St. 2880, 2 spec. St. 2897, 17 spec. St. 3042, 10 spec. St. 3043, 12 spec.

The species seems to be rather scarce in the Kattegat. It is not known to enter the Sound or the Belts.

Opheliidæ

Ophelia limacina Rthke.

"Dana" St. 2837, 5 spec. St. 2840, 2 spec. St. 2842, 1 spec. St. 2843, 1 spec. St. 2881, 2 spec. St. 2891, 1 spec. St. 3047, 4 spec. St. 3049, 7 spec.

I do not know if Eliason is right in saying that this species "im Kattegat fast nur im westlichen Teil vorkommt"; it depends upon how much stress one is laying on the little word "fast". At any rate all the specimens taken by the "Dana" originate either from the Eastern part of the Kattegat or from about the middle. In the Sound Ophelia limacina seems to be scarce south of Hveen.

Travisia forbesi Rthke.

"Dana" St. 3049, 1 spec. St. 3132, 1 spec. St. 3141, 2 spec. St. 3089, 4 spec. St. 3091, 2 spec.

I do not believe that this species is so scarce as it seems concluding from the dates of capture. It was taken now and then at Hellebæk during the marine biological summer-course for students. Possibly the peculiarity that the animal covers itself by attaching sand-particles to its body is the reason why it is rather frequently overlooked. In Danish waters it enters the western parts of the Baltic.

Ammotrypane aulogaster Rthke.

"Dana" St. 2906, 2 spec. St. 2907, 3 spec. St. 3007, 1 spec. St. 3014, 1 spec. St. 3042, 8 spec. St. 3043, 4 spec. St. 3045, 5 spec. St. 3048, 1 spec. St. 3049, 1 spec. St. 3053, 19 spec.

Rather common in many parts of Danish waters. Not found in the Baltic. Common in the northern part of the Sound, but hitherto does not seem to have been recorded from the Belts.

Chloræmidæ

Stylarioides plumosa (O. F. M.).

"Dana" St. 2860, 2 spec. St. 2963, 11 spec.

Very common in Danish waters.

Stylarioides glauca Mgrn.

"Dana" St. 2889, 3 spec. St. 2907, 1 spec. St. 3041, 2 spec.

The species seems to be common nowhere in Danish waters. But it is recorded within the Scaw from many localities in the Kattegat and it may occur in the Belts and in the Sound as well, at any rate in the Northern parts of these waters.

Flabelligera affinis Sars.

"Dana" St. 2800, 1 spec.

Scarce on most localities, but it can be found rather far southwards in the Belts and in the Sound; it does not enter the Baltic.

Amphinomidæ

Paramphinome pulchella Sars.

"Dana" St. 2897, 1 spec.

It does not seem to occur within the Scaw.

Scalibregmidæ

Eumenia crassa Ørsted.

"Dana" St. 2889, 5 spec. St. 2906, 6 spec. St. 3047, 4 spec. St. 3053, 1 spec. St. 3057, 2 spec.

Rather common in Danish waters. It enters the Sound as well as the Belts, but it does not enter Baltic waters.

Capitellidæ

Notomastus latericius Sars.

"Dana" St. 2880, 13 spec. St. 2842, 2 spec. St. 2856, 2 spec.

Inside the Scaw it is not uncommon in the Kattegat, but it seems very rarely to enter the Belts and the Sound.

Maldanidæ

Nicomache lumbricalis (Fabr.) Mgrn.
var. *borealis* Arwidss.

"Dana" St. 3014, 1 spec. St. 3047 3 spec. St. 3054, 2 spec.

Very common on suitable bottom in the Kattegat, the Skagerrack and the North Sea. It enters the Northern parts of the Sound, where its southern limit, after Eliason, is the Isle of Hveen.

Rhodine gracilior (Tauber).

"Dana" St. 2906, 1 spec. St. 2953, 2 spec. St. 3014, 12 spec. St. 3047, ca. 20 spec.

The species is found anywhere in Danish waters on suitable bottom. It is not scarce in the Sound and the Belts and it enters the western parts of the Baltic. The "Dana" has taken it in the "Fehmern Belt", one seamile W. of the light-ship.

Isocirrus planiceps M. Sars.

"Dana" St. 3014, 1 spec.

The only specimen, taken by the "Dana", originates from the Skagerrack between Norway and Denmark at a depth of 135 m.

Praxilella affinis M. Sars.

"Dana" St. 3014, 1 spec.

Only one specimen taken at the same locality as the preceding species.

Maldane Sarsi Mgrn.

"Dana" St. 2906, 1 spec.

It is to be supposed that M. Sarsi in Danish waters has its southern limit in the southern parts of the Sound and the Belts, but with certainty this cannot be stated for the moment. The only specimen taken by the "Dana" originates from the Skagerrack.

Euclymene droebachiensis G. O. Sars.

"Dana" St. 2907, 1 spec.

One specimen was taken in the Skagerrack twenty six seamiles NW. t. W$^1/_2$W. off Rubjerg Knude lighthouse on sandy bottom. The species in question seems to be very scarce in the Kattegat; Levinsen mentions only one specimen from the Northern part and Lönnberg one, taken in the Sound Southwest of the "Knæhaksbake" on 29 m. Further one specimen is mentioned by Eliason from the Northern part of the Sound.

Asychis biceps (M. Sars).

"Dana" St. 3014, 1 spec.

This species is widely distributed in Northern seas. It is known from the coast of West Greenland, from Iceland, Scotland, the Scandinavian peninsula and from Danish waters. Within the Scaw it seems to be very scarce. It is not mentioned by Levinsen as recorded by the gun-boat "Hauch", but Tauber states that a specimen has been taken in the Kattegat (without closer locality) by Krøyer. The specimen present in the "Dana"-material originates from the Skagerrack, where it was taken 41 sea-miles NW. 1/4 W. of Hanstholm lighthouse at a depth of 135 m.

Ammocharidæ

Owenia fusiformis delle Chiaje.

"Dana" St. 2851, 1 spec. St. 2906, 2 spec. St. 2907, 4 spec. St. 3041, 4 spec. St. 3045, 1 spec. St. 3047, 1 spec. St. 3049, 2 spec.

All the specimens taken by the "Dana" originate from the Skagerrack, the North Sea or the Kattegat, but the species under consideration enters the Sound and is to be found at any rate in the Northern parts of this water.

Amphictenidæ

Pectinaria auricoma O. F. M.

"Dana" St. 2875, 1 spec. St. 2881, 1 spec. St. 2891, 3 spec. St. 2906, 4 spec. St. 2907, 12 spec. St. 3014, 2 spec. St. 3045, 4 spec., St. 3047 4 spec. St. 3049, 3 spec.

Most of the specimens recorded by the "Dana" originate from the North Sea and the Skagerrack, part of them from the Kattegat. The species is besides known from the Northern part of the Sound and the Belts.

Pectinaria Koreni Mgrn.

"Dana" St. 2889, 6 spec. St. 2905, 1 spec. St. 2963, 1 spec.

Very common in Danish waters. It is to be found anywhere in the Sound on suitable bottom, and the same seems to hold

good for both of the Belts. Possibly it enters the western part of the Baltic.

Pectinaria belgica Pall.

"Dana" St. 2842, 2 spec. St. 2845, 3 spec. St. 2902, 1 spec. St. 2906, 2 spec. St. 3047, 1 spec. St. 3048, 1 spec. St. 3053, 2 spec.

Most of the specimens originate from the North Sea, some few from the Kattegat, S.E. of Læsø and one specimen from the northern part of the Sound. The largest specimen brought home by the "Dana" has a tube, the length of which makes 97 mm. Another specimen — also originating from the Kattegat and found in our museum has a tube, the length of which makes 126 mm.

Petta pusilla Mgrn.

"Dana" St. 2881, 3 spec. St. 3049, 1 spec.

This species seems to be scarce everywhere. Evidently it has a rather wide range as it is recorded from the Arctic as well as from the Mediterranean, but on account on its sporadic occurrence it is impossible for the moment with any accuracy to fix the limits of its distribution. -- From Danish waters it was — as far as I am aware — hitherto not recorded, but it is known to occur in the Fjords of the west-coast of Sweden.

Ampharetidæ

Amphicteis Gunneri Mgrn.

"Dana" St. 2880, 1 spec. St. 3014, 3 spec. St. 3054, 1 spec.

Seems to occur in most of the Danish waters excepting the Baltic.

Amparete Grubei Mgrn.

"Dana" St. 2860, 1 spec. St. 2889, 1 spec. St. 2906, 3 spec.

Occurs almost anywhere in Danish waters. It is also recorded from the southern part of the Baltic.

Melinna cristata M. Sars.

"Dana" St. 2896, 1 spec. St. 2897, 52 spec. St. 3042, 8 spec.

All the specimens taken by the "Dana" originate from the waters

outside the Scaw. The species has besides been recorded sometimes from the Kattegat, but it does not seem to enter the Sound or the Belts.

Amage auricola Mgrn.

"Dana" St. 3045, 1 spec.

The only specimen present originates from the Eastern part of the Kattegat. As far as I am aware it is the first find of this species in Danish waters.

Samytha sexcirrata M. Sars.

"Dana" St. 3014, 1 spec.

This species has once been recorded from the Northern part of the Kattegat, taken by the Gun-boat "Hauch". The specimen secured by the "Dana" originates from the Skagerrack.

Terebellidæ

Terebellides Stroemi Sars.

"Dana" St. 2889, 6 spec. St. 2906, 2 spec. St. 2955, 6 spec. St. 2960, 2 spec. St. 3043, 1 spec. St. 3045, 1 spec. St. 3054, 3 spec. St. 3081, 10 spec. St. 3086, 12 spec. St. 3098, 3 spec. St. 3127, 24 spec. St. 3128, 21 spec. St. 3129 11 spec. St. 3130, 47 spec. St. 3131, 1 spec. St. 3132, 1 spec. St. 3135, 2 spec.

Common in all Danish waters. In the Baltic it occurs from the Western part until the entrance to the Gulf of Finland.

Pista cristata (Müll.).

This species was not taken by the "Dana", but as it seems to be rather scarce in Danish waters I shall here name a few new localities from later years; they all belong to the Kattegat. N. t. W. of "Trindelen", 7 miles, 38 m. N. t. W. of "Trindelen", 8 miles, 42 m. E. of Frederikshavn, 6 miles 30 m.

Lanice conchylega (Pall.).

"Dana" St. 2843, St. 2846, St. 2848, St. 2850, St. 2852, St. 2906, St. 3000, St. 3047.

Empty tubes have been taken at the above named localities.

Nicolea zostericola Ørsted.

"Dana" St. 3000.

The only specimen taken by the "Dana" originates from the Skagerrack.

Neoamphitrite figulus Dalyell.

Amphitrite Johnstoni Mgrn.

"Dana" St. 2963, 2 spec. St. 3084, 1 spec. St. 3105, 2 spec. St. 3115, 2 spec.

Appears not to be scarce in the Baltic. The "Dana" has taken it as far East as in the neighbourhood of Bornholm.

Neoamphitrite Grayi (Mgrn.).

"Dana" St. 2963, 1 spec.

The only specimen present originates from a locality as far South as the Belt of Fehmern. It seems to be the only Danish specimen hitherto recorded of this species.

Artacama proboscidea Mgrn.

"Dana" St. 2963, 3 spec.

Three specimens were taken at the same locality as the preceding species.

Thelepus cincinnatus Fabricius.

"Dana" St. 2860, c. 12 spec. St. 2850, 1 spec. St. 2875; 1 spec. St. 2839, 1 spec. St. 2906, 2 spec. St. 2907, 1 spec. St. 2908, 2 spec. St. 3015, 1 spec. St. 3047, 3 spec., St. 2974, 2 spec.

While almost all the specimens, taken by the "Dana", originate either from the North Sea, the Skagerrack or the Kattegat, that is from waters of relatively high salinity, one find originates from the southern part of the Little Belt. Hitherto no find of the species under consideration is, as far as I am aware, known from the Belts; and the specimen taken the furthest South in the Sound is one from Hellebæk mentioned by Levinsen.

?*Polycirrus norvegicus* Wollebæk.

"Dana" St. 2800, 1 spec.

It is with some hesitation that I refer the only specimen taken

by the "Dana" to Wollebæk's species of this genus, not least considering the southern locality from which it originates. But besides it differs from the named species in having a considerably greater number of hair bristle-bearing parapodes, than *P. norvegicus* ought to have, namelely 27. Wollebæk indicates 16 for his species; Hesle 14 to 20 for the same species, and this latter author calls attention to the great variation of the number of hair-bearing parapodes in the different species of the genus under consideration, and he points out that the same holds good for the species of the genus Thelepus too. Therefore, regarding the only specimen of Polycirrus at my disposal, the condition of which is not very good, and which I am not able to refer to any other species of this genus, I have no other choice than to refer it to *P. norvegicus* and to point out the differences between the specimen from the "Dana" and the descriptions of Wollebæk and Hesle. Besides the above named difference concerning the number of bristlebearing Notopodials I shall point out that nephridial papillæ are seen on the first bristle-bearing segment to the seventh incl. Further the tips of the hair-bristles are not beset with coarse hairs as state both of the named authors; it is very difficult to see if hairs are present or not, even with immersion lens. If this be so the hairs must at any rate be very tiny. The length of the "Dana"-specimen is ca. 104 mm, while Hesle indicates the greatest length observed by him as 36 mm.

P. norvegicus is hitherto only known from Norway and from the western coast of Sweden.

Amæa trilobata (Sars).

East of Frederikshavn. 6 miles. 30 m.

The species is hitherto only known from Norway and Sweden. The specimen at my disposal is the only one hitherto recorded from Danish waters.

Lysilla Lovéni Mgrn.

N.W. of "Trindelen". 8 miles. 39 m.

"Læsø Rende". 38—41 m.

N. of Frederikshavn. 36 m.

Off "Knudshoved" 18.V.1913. Blegvad.

Presumably Lysilla Lovéni is not quite as scarce in the Katte-

gat as Eliason seems to suppose, at any rate in the northern part of this water. The one specimen from the Great Belt seems to indicate that the species under consideration is perhaps to be found more southwards than hitherto supposed, and that it is perhaps more euryhaline.

Sabellidæ

Dasychone Dallyelli (Köll.).

"Dana" St. 2856, 1 spec.

The only specimen taken by the "Dana" originates from the North Sea.

Sabella pavonia Sav.

"Dana" St. 2843, 5 spec. St. 2848, 2 spec. St. 2860, 2 spec. St. 3014, 1 spec. St. 3047, 2 spec.

All the specimens taken by the "Dana" originate either from the North Sea, the Skagerrack or the Kattegat. But the species is known to enter the Sound and the Belts and is not scarce in the northern part of these waters.

Chone Duneri Mgrn.

"Dana" St. 2837, 1 spec.

The only specimen taken by the "Dana" originates from the North Sea.

Chone infundibuliformis Kr.

"Dana" St. 2817, 1 spec.

The "Dana" has taken one specimen in the North Sea.

Euchone rubrocincta (Sars).

"Dana" St. 3049, 1 spec.

The species which is known from Norway and the western coast of Sweden has not hitherto been recorded from Danish waters.

Serpulidæ

Pomatocerus triqueter (Mørch).

"Dana" St. 3015. St. 2844. St. 2856. St. 2905. St. 2891. St. 2873. St. 2894. St. 2843. St. 2855.

This very common species is present in various numbers or masses from the stations here named, all pertaining either to the Skagerrack, the North Sea or the Kattegat.

Hydroides norvegica (Gunn.).

"Dana" St. 2805. St. 2850. St. 2860. St. 2875. St. 2905. St. 2907. St. 3015.

By the "Dana" only taken in the North Sea and the Skagerrack.

Spirorbis borealis Daud.

"Dana" St. 2974.

Only one find from the "Dana" originating from the Great Belt.

In concluding this paper I wish to thank Mag. sc. P. Kramp to whom we are indebted for the very important collection of Polychæta originating from the cruises of the "Dana" in 1922—23.

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15—10—1925.

Underkäksfragment och lösa tänder av människor från Danmarks äldsta stenålder.

Av
John Arnborg, Lund.

(Resumé in deutscher Sprache S. 413—422).

Sedan oktober 1923 är författaren till denna uppsats å Lunds Anatomiska Institutions antropologiska laboratorium sysselsatt med en undersökning av därvarande underkäkar från forntid och nutid. Det är därför naturligt, att de senaste märkliga underkäksfynden från Sværdborgs och Mullerups mossar, publicerade i Aarbøger for Nordisk Oldkyndighed og Historie 1921 av prof. H. A. Nielsen[1]), väckt mitt synnerliga intresse och givit anledning till särskilda reflexioner och jämförelser. Vidare hade prof. Fürst, som varit i tillfälle att se ifrågavarande underkäkar i Nationalmuseet i Köpenhamn, yttrat till mig, att han ansåg, att dessa underkäkar borde mera ingående kritiskt bearbetas och avbildas, innan man därpå kunde stödja antropologiska och arkeologiska slutledningar[2]). Därför beslöt jag julen 1923 att på ort och ställe söka få till stånd en dylik undersökning. Genom tillmötesgående av chefen för den förhistoriska avdelningen vid Nationalmuseet, inspektör C. Neergaard, och genom benäget bistånd av statsgeologen dr. phil. V. Nordmann samt med biträde av Nationalmuseets fotograf, herr Sophus Bengtsson, lyckades jag taga åtskilliga bilder, vilka

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1) Sid. 205 ff. under titeln: Fund i Sværdborg og Mullerup Moser af Skeletdele af Mennesker fra den ældste Stenalder. Även tryckt i den franska upplagan af Aarbøger (Mémoires de la Société royale des Antiquaires du Nord 1920—25 p. 33 ff.) under titeln: Squelettes humains du plus ancien âge de la pierre découverts dans les tourbières de Sværdborg et de Mullerup.

2) Carl M. Fürst, Den svenska antropologien och Antropologiska sällskapet, Ymer 1923, sid. 185.

kunna bidraga till att ge ett bättre begrepp om de redan genom sin höga ålder märkliga underkäksfynden. Även fick jag ingående mäta och studera underkäksfragmenten samt jämföra dessa med det rika antropologiska material, som finnes å Nationalmuseet i Köpenhamn och som genom prof. H. A. Nielsen's betydelsesfulla sammanställningar och beskrivningar kommit vetenskapen till godo[1]. Mina förut omnämnda undersökningar ha kombinerats med upprepade studiebesök i Köpenhamn å såväl Nationalmuseet som å Zoologisk Museum och Det Normalanatomiske Institut, varefter det blev mig klart, att den antropologiska särställning, som prof. H. A. Nielsen ansett de bägge underkäkarna intaga, ej gärna kunde anses föreligga. Ursprungligen hade jag för avsikt att endast publicera dessa undersökningsresultat i samband med en större avhandling om underkäkens antropologi, men det intresse, varmed H. A. Nielsen's uttalanden omfattats såväl i naturvetenskapliga[2] som särskilt i arkeologiska[3] kretsar, och de slutledningar rörande Nordens äldsta befolkning, vilka i dessa kretsar dragits, ha emellertid verkat därhän, att jag funnit mig föranlåten att tillmötesgå önskningarna om en tidigare separat publikation. Den välvilja och gästfrihet, som visats mig av Zoologisk Museums chef, prof. dr. phil. Ad. S. Jensen, har gjort, att jag på hans önskan lämnar mitt första meddelande i denna tidskrift.

Vad som inledningsvis bör framhållas är, att prof. H. A. Nielsen i sin ovannämnda uppsats ställer den paleolitiska tiden i motsats till rentiden, vilket kan verka förvillande, då enligt den i bruk

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1) Publikationer häröver finnas införda i Aarb. f. nord. Oldk. og Historie 1906, 1911 och 1915.

2) Victor Madsen, Grundtræk af Jordens Historie (Kultur og Videnskab, udgivet af Studentersamfundets Oplysningsforening, København 1923), sid. 86 f. August Brinkmann, Canidenstudien V—VI (Bergens Museums Aarbok 1923—24. Naturvidensk. Række n:o 7) sid. 4.

3) Gunnar Ekholm, De arkeologisk-etnologiska problemen i Östersjöområdet, Ymer 1923, sid. 53 och Det brakycefala elementet i Nordens befolkning, Ymer 1924 sid 52 f. samt Die erste Besiedlung des Ostseegebietes (Wiener Prähistorische Zeitschrift 1925) sid. 9. Haakon Shetelig, Primitive Tider i Norge (Bergen 1922) sid. 347. Birger Nerman. Die Herkunft und die frühesten Auswanderungen der Germanen, Kungl. Vitterhets Historie och Antikvitets Akademiens Handlingar Följd III. I:5 1924, sid. 7. H. C. Broholm, Nye Fund fra den ældste Stenalder (Aarb. f. nord. Oldk. og Hist. 1924) sid. 86 och 140 f.

varande arkeologiska terminologien rentiden utgör den sista delen av den paleolitiska tiden. S. t. ex. indelar M. Boule i sitt bekanta arbete Les Hommes Fossiles[1]) den paleolitiska tiden (paléolithique) i I. flodhästens period (époque de l'Hippopotame), II. mammutens period (époque du Mammouth) samt slutligen III. renens period (époque du Renne). Om man, såsom H. A. Nielsen gör, sätter rentiden lika med cromagnonrasens tid[2]), så bör man med den paleolitiska tidens människor mena neandertalrasen. I varje fall blir termen "palæolithisk underkjæbe" närmast att förstå som neandertaloid underkäke eller rättare underkäke av neandertalare, vilket i föreliggande fall skulle passa, då han anser, att dessa underkäkar sakna haka. Han säger nämligen i sin ovannämnda uppsats[3]) om sværdborgkäken, att den framvisar "en række palæolithiske fremtoninger: I. manglende hageprominens, II. manglende crista genioglossa[4]) og III. 5 tandknuder på alle de 3 store blivende molarer i underkjæben, af hvilke den sidste i hvert fald er større end den anden og længere end første." Uppgiften för mig är här att ställa under kritik var och en av dessa underkäkens påstådda karaktärer.

I.

Vad "hageprominensen" (hakframsprång, das vorspringende Kinn enl. Bolk) beträffar, är en sådan, som av H. A. Nielsen's bild å sid. 206 framgår, dock redan förhanden. Prof. Fürst och Dr. V. Nordmann ha fäst min uppmärksamhet på, hurusom den fotografiska bilden hos H. A. Nielsen ger ett missvisande intryck. Den egentliga (= sagittala) hakprofilen ligger nämligen på bilden, då man närmare studerar densamma, framför dess yttre konturlinje. En korrekt fotografisk bild, sådan som författaren lyckats få taga å Nationalmuseet i Köpenhamn (fig. 1), anger ett långt tydligare och mera markant hakframsprång. Härtill kommer, att prof. H. A.

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1) 2e éd. Paris 1923, p, 49.

2) anf. arb. sid. 207.

3) sid. 210.

4) H. A. Nielsen är tämligen ensam om att använda formen genioglossa i sina resp. förbindelser fossa eller crista genioglossa. I hithörande litteratur talar man alltid om fossa resp. spina genioglossi, vilken form även alltid kommer att användas i den följande framställningen.

Nielsen till jämförelseobjekt valt en alltför kontrastverkande och föga lämplig bild av en underkäke med beteckningen "Underkjæbe fra nyere Tid". Några andra avbildningar finnas icke i uppsatsen. Nielsen menar, att sværdborgkäken tillhört en 16—18 års yngling.

I sin ovannämnda uppsats har han även omtalat ett fynd av tvenne underkäksfragment, som gjorts av nuvarande intendenten vid Göteborgs museum, fil. dr. Georg Sarauw, vid dennes klas-

Fig. 1. Vänstra underkäksfragmentet från Sværdborgs mosse, sett i profil. Foto 1/1.

siska utgrävning av en maglemosetidsboplats i Mullerups mosse. Dessa fragment finnas omnämnda av Herluf Winge uti Sarauw's berättelse[1]). Sarauw och Winge ha dock nöjt sig med att anteckna fyndet av en barnunderkäke. Nielsen har bestämt denna till att ha tillhört ett 7—8 års barn. Om denna underkäke säger han å sid. 216, att den I. "mangler hageprominensen og endog i nok så høj grad som Sværdborgkjæben, idet konturen her gåer mere stejlt ned. Tilllige mangler Mullerupkjæben II. den neolithiske tids crista eller spina mentalis superior, der her ligesom i Sværdborgkjæben er erstattet af en grube som i de palæolithiske kjæber."

Det är anmärkningsvärt, att prof. H. A. Nielsen jämför hakframspränget hos ett 7—8 års barn (mullerupkäken) med sværdborgkäkens, vilken enligt honom tillhört en 16—18 års yngling,

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1) Aarb. f. n. Oldkyndighed og Historie 1903, sid. 198. I reviderad form finnes denna avhandling återgiven i Praehistorische Zeitschrift Bd. III 1911 och Bd. VI 1914. Fynden av människoben behandlas i Bd. III sid. 101.

samt att han såsom typiskt nutidsexempel avbildar en underkäke av den extrema typ, som förefinnes hos åldriga individer med begynnande alveolaratrofi. Envar, som sysslat med underkäkar av skilda åldersklasser, får klart för sig, att hakframspränget är en karaktär, som utvecklar sig så småningom under den individuella utvecklingen. Å Lunds Anatomiska Museum har jag kunnat undersöka ett rätt stort antal barnunderkäkar från förhistorisk tid, tidig medeltid och nutiden. Jag har därvid kunnat konstatera, att ett stort antal käkar av barn i 7—8 års åldern förete en lika ringa utbildning av hakframspränget som käken från Maglemose vid Mullerup, i några fall t. o. m. mindre. Man kunde därför frestas att säga, att mullerupkäken med hänsyn till ålder och hakframsprång är närmast att betrakta som normal. Vad återigen underkäken från Sværdborg beträffar, så finner man även bland fullväxta individers underkäkar betydligt mindre hakframsprång. Min erfarenhet stöder sig här såsom i övrigt huvudsakligen på svenskt skelettmaterial. I ett nyutkommet arbete av Louis Bolk, Die Entstehung des Menschenkinnes[1]) belysas emellertid förhållanden, som ganska tydligt klargöra formen hos de här avhandlade underkäkarna. Bolk har haft ett utomordentligt rikt material till sitt förfogande. Av underkäkar av barn i åldern 2—6 år har han undersökt c:a 1000, i åldern 6—7 år 200 samt 300, som befunnit sig på tandömsningens stadium. Det torde därför vara lämpligt att på ett par punkter referera hans undersökningar och dess resultat. Han sägar å sid. 30 om käkar av barn i 5—6 levnadsåret "dass sie im allgemeinen kein vorspringendes Kinn haben" — — — "Die Profillinie von Kiefern in diesem Alter zieht als Ganzes gerade abwärts, oder sie ist ein wenig schräg nach vorn gerichtet. Von einer Prominenz des basalen Kieferteiles vor dem alveolaren ist aber keine Rede". — — — "Der Vorderteil von Kiefern aus dem dritten bis sechsten Lebensjahre besitzt denn auch meistenteils eine über die ganze Höhe des Kiefers gehende sanfte gleichmässige Wölbung. Nicht selten ist es schwierig, an solchen Kiefern die Grenzen des Kinndreieckes fest-

1) Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam, Tweede Sectie, Deel XXIII, No. 5, Amsterdam 1924. Bolk har lämnat ett preliminärt meddelande på engelska i samma akademis Proceedings Vol. XXVII N:os 3 and 4, 1924, sid. 329—344 under titeln: The chin problem.

zustellen.“ Bolk framvisar åtta stycken bilder av underkäkar av barn i åldern 3—6 år. På tvenne av dem har 6-års molaren redan framkommit, och förete dessa båda käkar rätt stor likhet med mullerupkäken, som ju endast bör vara något år äldre.

Det är, framhåller Bolk, först i och med tandömsningen, som en definitiv haka utbildas. Han lämnar[1]) bilder av tvenne käkar från 8-åriga barn som exempel härpå. I ena fallet ha de permanenta incisiverna redan framkommit, i andra fallet hålla de just på att bryta fram. Betraktar man profillinjerna utav de båda käkarna, finner man, att de första antydningarna till hakframsprång (hageprominens) redan framkommit. Dessa första antydningar uppkomma genom en ringa, men likväl mycket tydlig konkavitet på profillinjen i det alveolära partiet, varigenom en svagt prononcerad alveolarprognati uppstår. Ett positivt framsprång bildar den basala delen ännu inte; profillinjen synes i övre delen blott en smula inåtbuktad.

Ett verkligt framträdande av den basala delen kommer först under de följande åren till utveckling. Och att detta framsprång bildas tämligen fort, visa Bolk’s figurer 10, 11 och 12, i vilka de främre delarna av resp. 10, 11 och 12-åriga barns underkäkar äro avbildade i profil. Hakformen på dessa käkar kommer mycket nära de fullväxta individernas.

Så långt Bolk. Vad käken från Mullerup beträffar, har den blivit något skadad å incisivernas alveolarparti. Med avseende på åldersbestämningen 7—8 år låter sig käken inrangeras i det bolkska schemat såsom fullständigt normal. En face fotograferad visar sig (fig. 2 och 3) mullerupkäken liksom sværdborgkäken med tydlig hakprotuberans (Kinndreieck). I profil visar mullerupkäken en svag impressio subincisiva externa (fig. 4), sværdborgkäken en något starkare utvecklad sådan (se fig. 1), som mätte ett djup av c:a 1 mm. Om bildningen av denna impressio säger Bolk å sid. 32: “Konkaviteten inom området för alveolarpartiet, vilket av Klaatsch betecknades såsom impressio subincisiva externa, kallas av Virchow för incurvatio mandibulae anterior. Denna blir bestående och bidrager väsentligen till accentueringen av hakframsprångets basala del.“ Bolk framhäver nu, att denna incurvatio utbildar sig i anslutning till ömsningen av incisiverna, och att or-

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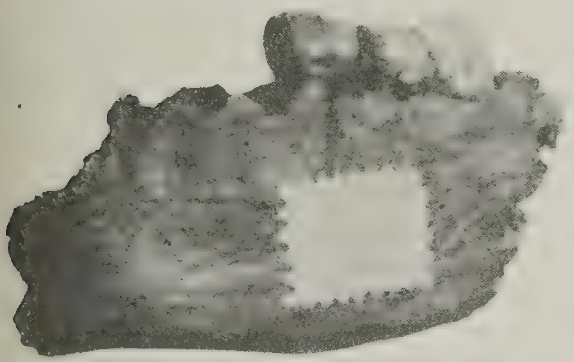
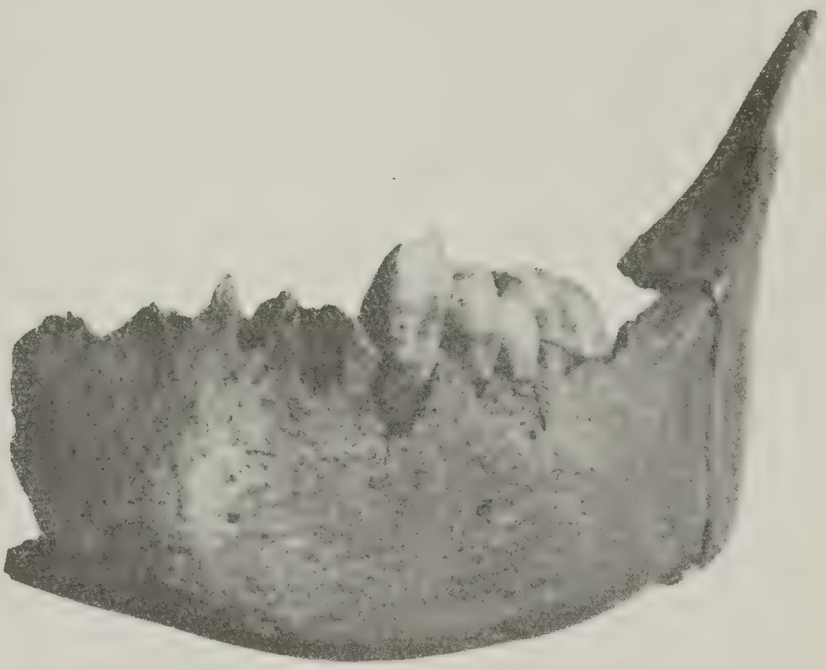
[1]) anf. arb. sid. 32.

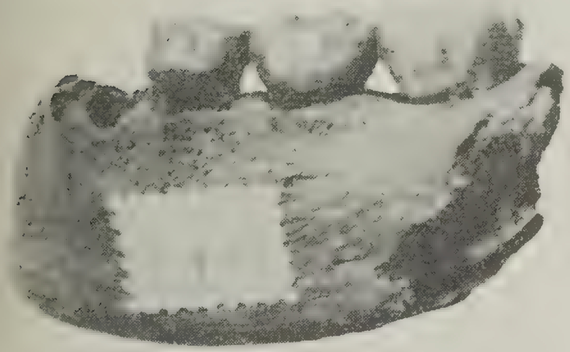
saken till dess uppkomst är en helt annan än den, som förorsakar framträdandet av den basala delen. "Denna incurvatio uppstår genom insänkning av käkytan, när incisivernas kronor, som fordra mera plats än rötterna, ha vuxit fram ur käkens inre. Käkar av barn från det 7—8 levnadsåret visa därför en stor likhet med de "diluviala" käkarna, hos vilka just en verklig positiv haka, d. v. s. ett framträdande av hakframsprångets basala del saknas, medan däremot incurvatio mandibulae anterior finnes



2.



3.



4.

Fig. 2. Vänstra underkäksfragmentet från Maglemose vid Mullerup, fotograferet en face. Foto $^1/_1$. — Fig. 3. Vänstra underkäksfragmentet från Sværdborgs mosse, en face fotograferat. Foto $^1/_1$. — Fig. 4. Vänstra underkäksfragmentet från Maglemose, sett i profil. Foto $^1/_1$.

mycket tydligt utbildad. Före incisivernas ömsning saknas denna incurvatio mandibulae."

Vad som här särskilt bör framhållas är den likhet, som förefinnes mellan underkäkar av barn i 7—8 års åldern och vad Bolk kallar de diluviala käkarna. Han tycks använda beteckningen diluvial i samma betydelse, som prof. H. A. Nielsen använt ordet paleolitisk, d. v. s. i betydelsen äldre diluvialtid respektive äldre paleolitisk tid. Vad Bolk menar med termen diluvial, förstår man bättre, då han på sid. 14 säger, att en framskjutande haka (proeminentes Kinn) är ett förvärv, som tillkommer de postdiluviala

människoraserna ("ein Erwerb postdiluvialer Menschenrassen"). Och ännu längre ned å sid. 14 säger han: "Der Kiefer mit einer gerade abfallenden Kinnregion, wie ein solcher uns im Grossen und Ganzen bei den altdiluvialen Menschenrassen begegnet" etc. Bolk använder alltså dels begreppet diluvial i motsats till postdiluvial, dels diluvial likvärdigt med "altdiluvial", under det att motsatsen till "altdiluvial" ju bör vara "jungdiluvial". Han rör sig här med termer hämtade från geologien, men så länge bättre enighet ej nåtts rörande parallelliseringen mellan de arkeologiska och geologiska perioderna, torde det för antropologerna vara lämpligast att hålla sig till den arkeologiska terminologien, alldenstund fornsaker ju ofta finnas, som datera skelettfynden. Eljest börjar man tämligen allmänt i Norden och Mellaneuropa geologer emellan anse, att perioderna aurignacien, solutréen och magdalénien äro diluviala och icke postdiluviala. Men ännu så länge passar den arkeologiska termen "jungpaläolitisch" bäst för dessa perioder. Bolk har icke nämnt något om de ungpaleolitiska raserna, men så mycket mer har H. A. Nielsen kommit in på dessa, i det han dock anser dem alla tillhöra en enda ras: cromagnonrasen. Han säger nämligen i sin ovannämnda uppsats å sid. 207: "Det, som dog strax og i højeste grad tildrager sig opmærksomheden, er, at underkjæben (sværdborgkäken) mangler den hageprominens, denne positivt fremstående hage, som alle nutids- och nystenalders mennesker have, ligesom også de fleste af rensdyrtidens, Cro-Magnon racens, mennesker have den, hvorimod alle kjendte palæolithiske og enkelte af rensdyrtidens mennesker mangle hageprominensen eller endog have en bagtil vigende hage. Dette ejendommelige forhold med tilstedeværelsen og manglen af hageprominensen have alle forskere iagttaget således"[1]). Desvärre tycks H. A. Nielsen's åsikter och yttranden härutinnan ej vara helt riktiga. I det under utgivning varande arbetet: Der fossile Mensch av E. Werth[2]) läses det å sid. 286: "Cromagnonmänniskans underkäke är kraftigt utvecklad och försedd med en bred, mycket brant uppstigande ramus. Hakan är framstående och

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1) spärr. av förf.
2) Berlin 1921 ff.

triangelformig. Denna korta karaktäristik av Verneau passar nästan på varje enstaka fall. Så t. ex. företer den gamle (= gubben) från Cro-Magnon (som tyskarna kalla der Alte von Cro-Magnon) i trots av alveolarkantens ytterst defekta tillstånd likväl tydligt en positiv haka enligt Klaatsch."

Å sid. 288 framhåller Werth, att underkäken av det manliga skelettet från den understa gravplatsen i Barma Grande (märkt Barma Grande n:o 2) utgör ett undantag från cromagnonrasens käkform. Barmagrandekäken, säger han, har en särdeles primitiv form. Ramus är låg och incisura condylo-coronoidea mycket grund och med sitt största djup liggande strax intill processus condyloideus. Den erinrar om förhållandena hos neandertalrasen och homo heidelbergensis. Hakan är tydlig och triangelformig men blott föga framstående, säger Verneau, och härmed, menar Werth, skiljer sig underkäken (Barma Grande n:o 2) helt och hållet från cromagnontypen. Särskilt med hänsyn till det knappast framskjutande hakframsprånget liknar denna underkäke aurignacmänniskan[1]) (homo aurignacensis Hauseri). Werth avslutar sin framställning härom på följande sätt: "Så är det likväl ingen tillfällighet, att denna underkäke tillhörde ett skelett, som låg på den djupaste nivån i grottan Barma Grande, och att denna underkäke genom sina primitiva karaktärer skiljer sig ifrån den underkäke, som funnits i den högst liggande graven i samma grotta." Det bör dock framhållas, att K. Saller[2]) hänför skelettet, märkt Barma Grande n:o 2, till en särskild ras: barmagranderasen, som han jämställar med cromagnonrasen, brünnrasen (= aurignacrasen) och grimaldirasen. Men vi gå vidare. Å sid. 213 säger Nielsen: "Der er flere af rensdyrtidens mænd, som mangle hageprominensen: Aurignacmanden (Klaatsch) og den store mand fra Grimaldigrotten, ligeså Verneau's unge mand på 18 år fra Barma Grande grotten." (Nielsen menar väl här den ovan avhandlade underkäken från Barma Grande.) "Også Chancelademanden mangler hageprominens." Vad nu det sista påståendet beträffar, att "Chancelade-manden mangler hageprominens",[3]) så påstår Boule

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[1]) spärr. av förf.

[2]) Saller, Anthropologischer Anzeiger 1925 sid. 179.

[3]) Jmf. i den franska översättningen av H. A. Nielsens avhandling (Mém. d. Antiq. du Nord 1920—25 p. 42): "Cette proéminence fait également défaut à l'homme de Chancelade".

i Les Hommes Fossiles[1]) raka motsatsen: "Le menton forme une saillie à la fois très large et très proéminente." Man har här hänfört "Chancelademanden" till en särskild ungpaleolitisk ras: chanceladerasen. (Boule, op. cit. p. 295 ff. Saller op. cit. p. 180.)

H. A. Nielsen's uppgift, att "den store mand fra Grimaldigrotten" [2]) skulle sakna hakframsprång, kan jag likaledes ej få verifierad i hithörande litteratur. Det är antagligen Verneau's "grand sujet masculin de la Grotte des Enfants", som H. A. Nielsen här menar. Verneau säger således i sin uppsats: Les fouilles du Prince de Monaco aux Baoussé-Roussé[3]): "Son maxillaire supérieur étroit, sa mandibule robuste, terminée en avant par un menton saillant et triangulaire[4]), sont autant de caractères, qui le rapprochent du vieillard de la Vézère." (Le vieillard de la Vézère = vad tyskarna kalla der Alte von Cro-Magnon.) "Les seules différences, que montre l'homme de la Grotte des Enfants, c'est une largeur relativement plus grande du nez et une tendance au parallélisme des branches horizontales du maxillaire inférieur[4]).

Nielsen anför till jämförelse med svärdborgfyndet de båda s. k. negroida skeletten (Verneau's "vieille femme et adolescent de la Grotte des Enfants") från Mentone och säger å sid. 213: "Og begge disse individer mangle hageprominens; den 18-årige mand[5]) synes endog at have en i høj grad palæolithisk vigende hage[4]), men dette er kun tilsyneladende og skyldes den betydelige prognati, som alveolarpartiet af hans kjæbe viser." Det bör dock fram-

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1) op. cit. p. 296; jmf. även fig. 192 p. 295.

2) (I den franska översättningen heter det likaledes å sid. 42: "l'homme de haute taille de la grotte de Grimaldi".)

3) L'Anthropologie 1902, p. 574; jmf. Verneau, Les Grottes de Grimaldi (Monaco 1906) T II, fasc. 1—2; Pl. III.

4) Spärr. av förf.

5) Beträffande ålderns säger Verneau op cit. 1902 p. 577: "Le jeune homme n'avait pas atteint l'âge adulte ... En lui attribuant 15 ou 17 ans, on ne doit pas être éloigné de la vérité." Vad bristen på haka angår, så framhåller Verneau och efter honom Werth, att både ynglingen och isynnerhet den gamla kvinnan äga hakframsprång Visserligen har ynglingen endast en obetydlig, trekantig prominens, men hos den gamla kvinnan är hakan mera betydande, ehuru liten och smal. Jmf. Verneau, Les Grottes de Grimaldi (Monaco 1906) T. II fasc. 1—2, p. 132—136, Pl. IV—V, samt Werth op. cit. p. 256.

hållas, att dessa bägge skelett ha urskilts såsom en särskild negroid ras (grimaldirasen) utanför cromagnonmänniskans variationsområde. Likaså har det förut omtalade skelettfyndet från Combe-Capelle (homo aurignacensis Hauseri) hänförts till en särskild ungpaleolitisk ras, aurignacrasen. Genom att urskilja dessa bägge raser vid sidan av cromagnonrasen blir denna mera avgränsad och enhetlig. Samma sak gäller om det år 1914 vid Obercassel gjorda fyndet av tvenne skelett, beskrivet av M. Verworn, R. Bonnet und G. Steinmann[1]). Bonnet, som gjort den antropologiska bearbetningen därav, anser, att det ena skelettet tillhört en 50—60 års man, det andra en 20—25 års kvinna. Vidare framhåller han, "dass beide trotz Verschiedenheiten doch blutsverwandt zu einer Sippe gehört haben müssen." Han är av den åsikten, att här föreligger "eine bisher unbekannte und neue Form des diluvialen Menschen[2])". Arkeologiskt hänföres fyndet med säkerhet till magdalénien, liksom även den geologiska tidsbestämningen talar för diluvialtidens senare del. Å sid. 287 uttalar sig Werth enligt Bonnet om mannens hakparti på följande sätt: "Der sehr kräftige Unterkiefer hat die Form eines V mit abgestumpftem Winkel, umfasst den Oberkiefer von aussen und trägt ein stark vorspringendes Kinndreieck." Saller hänför det manliga skelettet till en särskild ungpaleolitisk ras: Obercasselrasen[3]). Å sid. 85 säger Bonnet beträffande kvinnans underkäke att "Die Modellierung des Kinndreieckes ist bei der Frau schwächer als beim Manne." Å sid. 290 säger Werth: "Ferner unterscheidet sich der Gesichtsschädel der Frau von Obercassel von dem von Combe-Capelle (Homo Aurignacensis) noch durch das besser entwickelte Kinn und die beträchtlich grössere Winkelbreite des Unterkiefers. (Bonnet)." Saller hänför kvinnan till brünn- (= aurignac-) rasen[4]).

Emellertid ge dessa jämförelser mindre ledning vid bedömandet av de danska underkäkarna. Då likväl Nielsen anställt jämförelser mellan de ungpaleolitiska käkarna och de här avhandlade danska underkäksfragmenten, blev det även för mig nödvändigt att upptaga en sådan. Utan att behöva gå så långt med uppdelningen

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1) Verworn, Bonnet, Steinmann, Der diluviale Menschenfund von Obercassel bei Bonn (Wiesbaden 1919).

2) ovan anf. arb., sid. 181 och 184 f.

3) op. cit. p. 180.

4) op. cit. p. 178.

av de ungpaleolitiska skelettfynden i olika raser, som Saller gjort, anser jag mig dock med stöd av ovanstående kunna framhäva, att alla de ungpaleolitiska skelett, vilka utan tvekan kunna hänföras till cromagnonrasen, förete en kraftig haka, samt att även de övriga ungpaleolitikerna utmärkas av ett mer eller mindre tydligt hakframsprång. På det hela taget tycks nog även Bolk vara av denna mening, ty att döma av uttalandena å sid. 102 och 103 synes han som sagt med diluviala käkar mena dem, som ha tillhört homo primigenius, alltså neandertalmänniskan. (Heidelbergkäken ställer han i en annan grupp.) Om därför Bolk i stället för att tala om hakframsprånget såsom ett de postdiluviala rasernas förvärv hade tillerkänt de ungdiluviala eller ännu riktigare de ungpaleolitiska raserna denna ära, något som nog har varit hans mening, så hade däremot intet varit att invända. Som det nu är, tycks hans begrepp "diluvial" något så när täcka H. A. Nielsen's "palæolithisk". Med hänvisning till Bolk's ovannämnda sats, att underkäkar av barn i 7—8 års åldern ha stor likhet med neandertalrasens underkäkar, hos vilka en framskjutande haka saknas, skulle vi alltså här ha ett nytt exempel på tesen om att den individuella utvecklingen i viss mån rekapitulerar släktets utvecklingsgång. Ehuru det är oriktigt att jämföra underkäkar av barn, särskilt i åldern 7—8 år med fullvuxna individers underkäkar, ge dock mätningarna ett betydligt exaktare grundlag för jämförelser. Dess värre är underkäksfragmentet från Maglemose något skadat vid symfysen. En mätning av hakvinkeln (= symfysvinkeln) gav i trots härav ett approximativt värde på 70°. Om den individ, som denna barnkäke en gång tillhört, fått leva och tillväxa intill en 30--40 års ålder, hade säkerligen hakframsprånget blivit större och symfysvinkeln i motsvarande grad mindre än 70°. Det är emellertid egendomligt, att dock mullerupkäken faller inom gränserna för variationen hos symfysvinklarna på fullvuxna nutidseuropéer. Enligt Ernst Frizzi (Untersuchungen am menschlichen Unterkiefer mit spezieller Berücksichtigung der Regio mentalis)[1]) variera dessa mellan 65—71°[2]).

[1]) Archiv für Anthropologie XXXVII N. F. Bd. 9, sid. 269.
[2]) Frizzi angiver de olika måtten för symfysvinklarna i de fem världsdelarna på följande sätt:

Europa	65°	bis	71°
Asien	72°	„	75°
Amerika	75°	„	77°
Afrika	77°	„	80°
Australien und Ozeanien	80°	„	85°

Anmärkningsvärt är att en svensk medeltidskäke från Lödöse vid Göta älv företedde en symfysvinkel av 84°. Käken torde ha tillhört en individ på c:a 20 år. Symfysvinkeln på særdborgkäken var 66°. I betänkande av att særdborg- liksom mullerupkäken tillhört resp. 14 [1]) och 7 års barn, är symfysvinklarnas ringa storlek anmärkningsvärd. Jag anför efter Rudolf Martin, Lehrbuch der Anthropologie [2]) följande siffror för symfysvinklar samt hans därur dragna slutsatser till jämförelse med ovanstående.

Tiroler (Laas)	65°	Neuhebriden	77°	
Auvergnaten	66°	Neugeb. Europäer	93°	
Münchner	71°	La Naulette	94°	
Pariser	71°	Krapina	94—106°	
Chinesen	75°	Malarnaud	100°	
Peruaner	75°	La Chapelle-aux-Saints	104°	
Neger	83—85°	Mauer	105°	
Australier	83°	Spy	106°	
Neukaledonier	84°	La Quina	108°	(?)
Lemur	125°	Hylobates	93°	
Cebus	111°	Gorilla	93°	(105° Merejkowski)
Cynocephalus	108°	Schimpanse	100°	(115° Boule)
Macacus	116°	Orang-Utan	107°	(104° Merejkowski, 124° Boule)
Semnopithecus	111°			

“Die individuelle Variabilität des rezenten Menschen geht von 54°—94°, so dass die Neigung der vorderen Kieferplatte also in nur ganz seltenen Fällen hinter eine Senkrechte zurückgeht[3]). Nur im fötalen Leben ist dies die Norm. Als typisch für die erwachsenen Hominiden muss vielmehr eine starke Neigung der Symphyse von hinten oben nach vorn unten angesehen werden, die ihren höchsten Grad bei den orthognathen Europäern erreicht, deren Kinn die kräftigste Entwicklung zeigt. Ganz anders liegen die Verhältnisse bei Homo Neandertalensis, dessen mittlerer Kinnwinkel 103° beträgt, für den ein sogenanntes “fliehendes Kinn“ also ein durchaus charakteristisches Merkmal darstellt[3]). In diesem Punkt schliesst er

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[1]) Nielsen påstår, att svärdborgkäken tillhört en 16—18 års yngling, men under avdeln. III visas att åldern 14 år är betydligt sannolikare.
[2]) Jena 1914, sid. 871.
[3]) Spärr. av förf.

sich nahe an die Anthropomorphen an und entfernt sich von Homo sapiens. Kinnlosigkeit ist eine pithekoide Eigenschaft."[1]) Så långt Martin.

Av det som anförts, låta alltså de båda underkäksfragmenten med avseende på hakframsprånget inordna sig som normala europeiska underkäkar, isynnerhet om man tar hänsyn till deras ålder, något som också en blick på profilerna å fig. 1 och fig. 4 visar.

II.

Härmed övergå vi till punkt II., som behandlar saknaden av crista genioglossi såväl hos sværdborg- som mullerupkäken. Å sid. 207 säger H. A. Nielsen: "Men desuden" (Nielsen syftar här på den i avdelning I. behandlade förmenta bristen på hakframsprång) "har Sværdborgkjæben endnu et palæolithisk mærke i hageregionen. På hagepartiets bagflade have alle nystenalders- og nutidsmennesker en fremspringende kam, en spina mentalis superior eller crista genioglossa som tilhæftnings-, udspringsapparat for musculus genioglossus. Den palæolithiske underkjæbe har derimod i stedet for en crista en flad grube ned i benet med en ru og svagt toppet, lille knude som tilhæftningsapparat for m. genioglossus. Sværdborgunderkjæben har da også her ligesom den palæolithiske underkjæbe en fossa genioglossa i stedet for en crista. Dette ejendommelige forhold synes mig kun i ringe grad at være blevet bemærket, skjønt det nævnes og kjendes ret langt tilbage" ......

Nielsen tycks såväl av detta yttrande som av ett par andra, till vilka jag senare skall återkomma, ej ha någon större erfarenhet av de flerfaldiga sätt, varpå ursprunget för musculus genioglossus kan vara utbildat. Hans påståenden överensstämma ej heller med andra iakttagelser, som gjorts på detta område.

Toldt har i ett arbete med titeln: "Über den vorderen Abschnitt des menschlichen Unterkiefers mit Rücksicht auf dessen anthropologische Bedeutung"[2]), uttalat sig klarast om ovannämnda förhållanden[3]). Han framhåller, att denna spina blott förhållandevis

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[1]) Spärr. av förf.
[2]) Mitt. der Anthropologischen Gesellschaft in Wien, Bd. XLV (3. Folge Bd. XV) 1915.
[3]) Å sid. 255 under rubriken: Spina mentalis.

sällan visar sig som en enhetlig bildning ("nur verhältnissmässig selten erscheint sie als einheitliches Gebilde"). Toldt framhåller, att man nästan alltid kan skilja mellan ursprungsfältet för musculus genioglossus och det för musculus geniohyoideus. Därför är det av de tyska anatomerna fastställda gamla namnet spina mentalis, som sammanfattar båda ursprungsområdena, mindre lämpligt. Som av Toldt's forskningar framgår, passar namnet spina mentalis egentligen blott för rena undantagsfall, i vilka en enhetlig, för båda områdena gemensam kam, tagg eller list utbildat sig. Den bland de franska anatomerna brukliga terminologien, som skiljer emellan en apophysis geni superior (för musculus geniglossus) och en apophysis geni inferior (för musculus geniohyoideus)[1], passar betydligt bättre, menar Toldt, men det finnes många fall, då ursprungen icke kunna betecknas med termen apofys (på tyska Knochenauswuchs), emedan de äro flata (flach) eller fördjupade (på tyska vertieft = konkava eller urgröpta). Bäst motsvarande de faktiska förhållandena blir det att skilja på ursprungsområdena för de båda musklerna samt beteckna dessa såsom *area genioglossi* och *area geniohyoidei*. Toldt framvisar nu, på vilka mångfaldiga sätt area genioglossi kan vara utbildad hos nutidsmänniskan samt de stora förändringar, som denna är underkastad under den individuella utvecklingen. Han har undersökt 500 underkäkar av recenta fullvuxna individer samt 230 underkäkar av barn i åldern från $^1/_2$—15 år, och å sid. 256 lämnar han följande statistik av area geniglossi hos dessa barnunderkäkar:

"Die Muskelursprungsstelle der Area geniglossi erscheint:

Bei	38 Kindern von $^1/_2$ bis 2 Jahren	110 Kindern vom 3. bis 6. Jahre	72 Kindern vom 7. bis 15. Jahre
als Grübchenpaar in	73,6 %	52,7 %	30,1 %
als flache paarige Rauhigkeit in	16,0 „	34,6 „	43,5 „
als Höckerchenpaar in	10.4 „	12,7 „	26,4 „

Vi bortse här helt ifrån förhållandena hos area geniohyoidei, då prof. H. A. Nielsen icke funnit något anmärkningsvärt med hänsyn till ursprungsområdet för musculus geniohyoideus.

[1]) I de franska handböckerna användes vanligen pluralformen. Alltså: les apophyses géni supérieures och les apophyses géni inférieures, vilket passar än bättre, då, såsom i den följande framställningen skall visas, ursprungen oftast äro pariga.

Det visar sig sålunda, menar Toldt, att muskelursprungsfältet inom area genioglossi utbildas ursprungligen såsom ett par små gropar i de övervägande flesta fallen hos $^1/_2$—2 år gamla barn, att vidare utfyllandet av dessa små gropar (Grübchenpaar) till en parig, flat, ojämn yta (flache paarige Rauhigkeit) vanligen redan sker mellan 3—6 levnadsåret. Och att omvandlingen av denna ojämna yta till ett par spinae genioglossi (Höckerchenpaar) icke sällan redan har fullbordats intill 6:te och vanligare intill 15:de levnadsåret. Dessutom är att märka, hurusom under de 2 första levnadsåren en medial liten list (ein medianes Leistchen) förekommer mellan de båda ursprungsfälten inom area genioglossi i 16 % av samtliga fall. Emellertid visar det sig, att denna lilla list, som kan motsvara H. A. Nielsen's crista superior, mellan det 3—6 levnadsåret blott förekommer i 5,5 % samt mellan 7—15 året i 8 %. Emellertid utjämnas i flertalet av fallen denna list så småningom, ty hos vuxna individer finnes denna endast som ett sällsynt undantagsfall, medan H. A. Nielsen velat framhålla utbildningen av crista superior såsom det typiska för nutidens människor. Vi fortsätta nu referatet över Toldt's undersökningar av fullvuxna individers underkäkar. Han utvalde 500 underkäkar av fullvuxna individer från Museum der Wiener anatomischen Institute. Bland dessa 500 käkar inbegreps även 35 underkäkar av fullvuxna individer från den fornnubiska kyrkogården vid El Kubanieh, som tillhörde Wiener k. k. naturhistorisches Hofmuseum. Av samtliga underkäkar hade hos ett förhållandevis ringa antal de övre och undre muskelursprungen sammansmält till en enhetlig medial list. I dessa fall kunna vi alltså tala om en enhetlig spina mentalis i den mening, de tyska anatomerna tagit denna term. Emellertid utgör denna underkäksgrupp icke mer än 10,7 % av samtliga normala fall. Hos de övriga underkäkarna voro muskelursprungen mestadels fullständigt skilda. Bäst framträda dessa förhållanden genom att här återge Toldt's statistik in extenso:

"Bei den ausgewachsenen Unterkiefern erscheint die Muskelursprungsstelle der *Area genioglossi*, wenn sie selbständig ist:

als Grübchenpaar in	16	Fällen	=	3,9 %
„ flache paarige Rauhigkeit in	122	„	=	30,0 „
„ Höckerchenpaar in	260	„	=	63,9 „
„ mediane Leiste in	9	„	=	2,2 „

På de fullvuxna individernas underkäkar är alltså den ojämförligt vanligaste formen för ursprungsfälten inom *area genioglossi* ett par spinae (das Höckerchenpaar), 63,9 %, vilka dock i mer än hälften av fallen först kommit till utbildning efter det 15:de levnadsåret. Dessutom finnes kvar till ett rätt högt antal, näml. 30 %, den flata, pariga, ojämna ytan (die flache paarige Rauhigkeit), som var den mest typiska utbildningsformen mellan sjunde till femtonde levnadsåret (43,5 %) under det att den ursprungliga formen av tvenne små gropar blott i enstaka fall, 3,9 %, kvarstår. Ännu mera sällsynt, 2,2 %, förekommer en medial list (H. A. Nielsen's crista superior), som förekom förhållandevis mycket allmänt (16 %) under de två första levnadsåren.

Det är mot bakgrunden av dessa Toldt's forskningar, som H. A. Nielsen's resonemang och iakttagelser böra skärskådas. Då han därför å sid. 207 säger: "På hagepartiets bagflade have alle nystenalders- og nutidsmennesker en fremspringende kam, en spina mentalis superior eller crista genioglossa som tilhæftnings-, udspringsapparat for musculus genioglossus", har han därmed framdragit såsom typiskt det rena undantagsfallet. Det är icke en kam (eine mediane Leiste enligt Toldt, en crista genioglossi eller spina mentalis superior enligt Nielsen), som är det typiska, utan tvenne spinae genioglossi (Höckerchenpaar enligt Toldt), som utgöra ursprungsfälten för den pariga musculus genioglossus. Detta är det normala hos fullvuxna individer, men i mer än hälften av fallen ha dessa spinae utbildats efter 15:de levnadsåret. Om därför underkäksfragmenten från Sværdborgs och Mullerups mossar representerande resp. 7 och 14 års barn sakna dessa spinae i fullt utbildat tillstånd, kan ju det sägas snarast vara normalt. En undersökning av dessa käkar visar dock, såsom redan prof. Fürst vid sitt besök i Köpenhamn kunde konstatera, att vi ha antydningar till eller tydliga spår av tvenne spinae genioglossi. Ty man måste betänka, att de danska käkarna, vilka ju vardera företrädes blott av tvenne fragment, lätt kunnat, såsom Hans Virchow[1] beträffande de "diluviala" kä-

[1] Jmf. H. Virchow, Die menschlichen Skeletreste aus dem Kämpfe'schen Bruch im Travertin von Ehringsdorf bei Weimar (Jena 1920) sid. 49, där han säger, att i area muscularis (= area genioglossi och area geniohyoidei

karna framhåller, taga skada på så ömtåliga ställen som area genioglossi och area geniohyoidei, när brottytorna gå så nära dessa. De båda underkäksfragmenten från Sværdborgs mosse lågo enligt utgrävarens (Dr. Friis-Johansen) rapport till Nationalmuseet "ikke samlede men langt adskilte". Att det funnits möjlighet för att de eventuella spinae genioglossi hos sværdborgfragmentet kunnat bli skadade, framgår ur följande uttalande av Dr. Friis-Johansen därsammastädes. "Om et fuldstændigt og i Orden liggende Skelet var der slet ikke Tale, men kun om en tilfældig, ganske uordnet Hob af Menneskeknogler, liggende samlede paa et Stykke, der vel var en Kvadratfod stort .... En af de lange Rørknogler laa henover det ene Kæbestykke i en aldeles naturstridig Stilling .... Endvidere fandtes om, under og imellem de samme Bestanddele, hvoraf Kulturlaget sædvanlig bestaar, Flintaffald, Dyreben, Hjortetakker. Der er saaledes kun Tale om en Samling Menneskeben, henkastede med samme Skødesløshed som alle Dyreknoglerne." Friis-Johansen avslutar sin rapport med att betona, att kulturlagren voro orörda, att människobenen funnits in situ och att dessa liksom kulturlagret otvivelaktigt härrörde från maglemosetid. Det må vara hur som helst med skadorna inom area genioglossi. Sværdborgkäken företer i alla fall tydliga spår efter något, som kunnat vara spinae genioglossi; eller också ha vi här "die flache paarige Rauhigkeit", som Toldt funnit i 43,5 % för barn i åldern 7—15 år enligt förut meddelad översikt. Hos mullerupkäken äro spåren efter *spinae genioglossi* än tydligare. Däremot var den grop, som H. A. Nielsen nederst å sid. 216 talar om, icke någonstädes att finna å mullerupkäken (Fig. 5). Blott ett litet foramen supraspinosum ovanför de båda spåren efter spinae genioglossi står att upptäcka. Jag återkommer strax till berörda förhållanden. Prof. H. A. Nielsen har fäst ett mycket stort avseende vid den "fossa genioglossa", som han ansåg vara tillfinnandes å sværdborgkäken, (se fig. 6), och som han ställt i samband med motsvarande förekomst hos de "paleolitiska" käkarne, anförda i en

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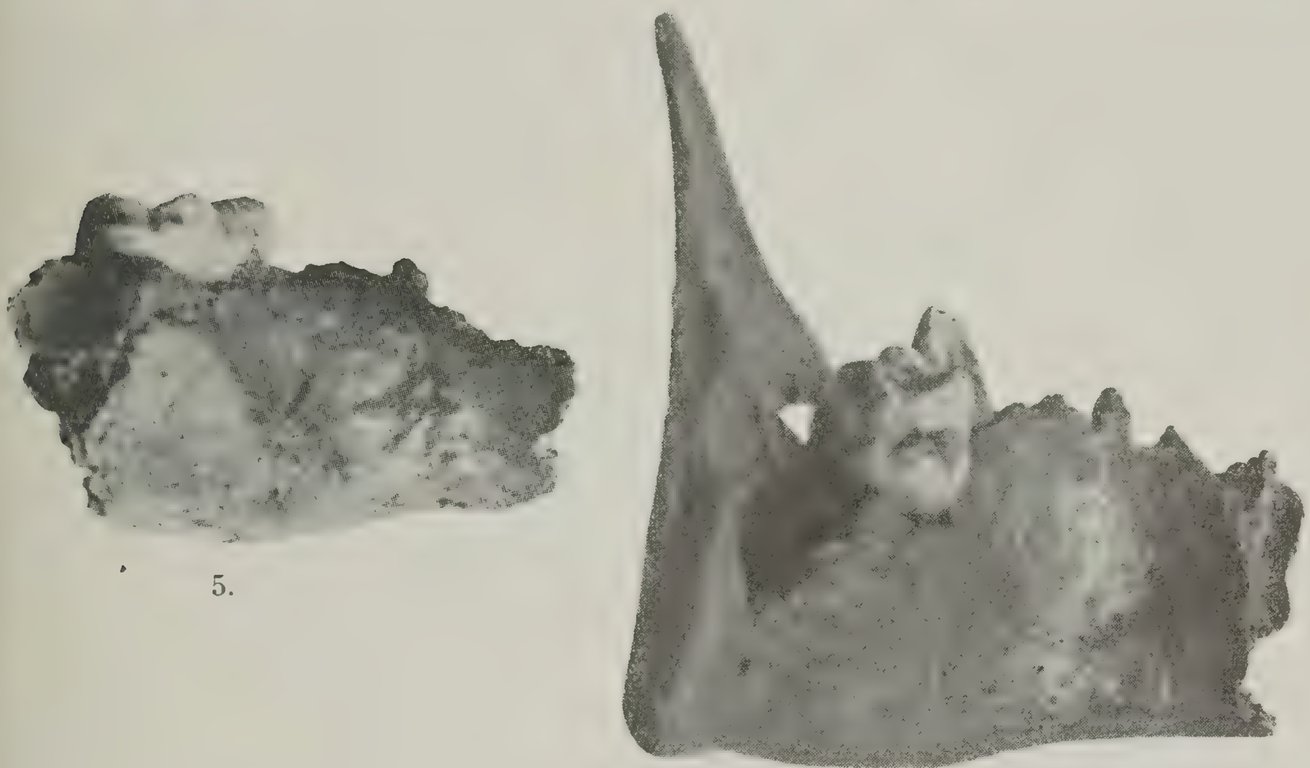
sammanslagna till en area) "finden leicht Beschädigungen statt, sowohl, weil der im Boden liegende Kiefer gern in der Mitte durchbricht und dadurch Stückchen der Area absplittern, als auch weil an dem noch weich aus dem Boden kommenden Knochen unebene Stellen abgestossen oder abgerieben werden können."

not å sid. 216[1]), i samband med den obefintliga gropen å mullerupkäken. Det får dock framhållas, att svärdborgkäken emellan de båda spåren av spinae, ehuru belägen något åt den alveolara delen av käken till, företedde en liten grop, troligen motsvarande fossula supraspinata, kallad så af Rudolf Virchow. Jag har funnit denna bevarad på ett å "Danmarks geologiske Undersøgelse" i Köpenhamn



5.

6.

Fig. 5. Vänstra underkäksfragmentet från Maglemose sett bakifrån. Foto $^1/_1$. — Fig. 6. Vänstra underkäksfragmentet från Sværdborgs mosse sett bakifrån. Foto $^1/_1$,

förvarat underkäksfragment från en "kökkenmödding" vid Hönsehals å Sjælland (Fig. 7), vilket dr. V. Nordmann gjorde mig uppmärksam på, emedan han hos detta fragment funnit överensstämmelser med sværdborgkäken. Hakan är ovanligt litet framskjutande. Symfysvinkeln mäter 70^0. Man märke utbildningen av torus mandibularis![2]) Hos de av H. A. Nielsen beskrivna underkäksfragmenten före-

[1]) "Det ses at være et gjennemgående træk, at nutidens og den neolithiske tids spina mentalis superior eller crista genioglossa på hagepartiets bagflade ved de palæolithiske underkjæber erstattes af en grube. Mortillet, Fraipont og Boule angive i deres respektive arbejder, at dette er tilfældet ved Heidelberg, La Naulette, Spy I og Spy II, La Ferrassie, La Chapelle aux Saints, Malarnaude og Ehringsdorfkjæberne."

[2]) Jmf. Carl M. Fürst, Der Torus mandibularis bei den Eskimos und anderen Rassen. Verhand. Anat. Ges. in Berlin 1908 S. 295 f. Se även samme förf. i Carl M. Fürst and Fr. C. C. Hansen, Crania groenlandica (Copenhagen 1915) p. 178 ff.

kom icke denna torus. Underkäksfragmentet från Hönsehals har tillhört en fullvuxen individ. Vidare fanns en liknande grop som på sværdborgkäken å en barnunderkäke, som av H. A. Nielsen ansetts ha tillhört en 15—20 års individ (av H. A. Nielsen betecknad med tvekan kvinnlig från Borreby "jættestue"[1]). Borrebykäken företedde även med avseende på hakframspränget en liknande utvecklingsgrad som sværdborgkäken. Egendomligt nog har H. A. Nielsen icke jämfört sværdborgkäken med någon av de barnkäkar från förhistorisk tid, vilka finnas förvarade å Nationalmuseet, dessutom omtalade och beskrivna av honom själv t. ex. i Aarbøger 1906. Däremot gör han sina jämförelser med de "paleolitiska" underkäksfynden[2]). Han vill ha bevisat, att svärdborgkäken skulle äga en verklig fossa genioglossi, jämförlig med de i noten å sid. 383

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[1]) Betecknad Borreby XIX och i Nationalmuseets inventarieförteckning lydande på numret 18519, omnämnd av H. A. Nielsen i hans avhandling Bidrag til Danmarks forhistoriske Befolknings, særligt Stenalderfolkets Anthropologi. Aarb. f. nord. Oldk. 1906, sid. 257. H. A. Nielsen konstaterar en ringa prognatism men nämner ingenting om förhållandena på underkäkens insida.

[2]) Man har många svårigheter att räkna med, då man skall ingå på dylika jämförelser, enär ju först och främst originalen äro behäftade med vissa defekter samt dessutom så väl gipsavgjutningar som bilder äro ytterst bristfälliga. Jmf. H. Virchow citerad av mig å sid. 382 i denna uppsats. Han säger ibid. (p. 49 alltså): "Es ist schwierig, ja in Wahrheit unmöglich, eine alles enthaltende und zugleich naturgetreue Abbildung zu liefern, wovon ich schon gesprochen habe. Beim Studium wendet man das Stück hin und her und beleuchtet es bald von dieser bald von jener Seite, bis man jedes Höckerchen, jedes Grübchen gesehen hat. Dies möchte man nun alles im Bilde vereinigen, tut damit aber des Guten zu viel, denn man sieht tatsächlich nicht alles so deutlich auf einmal auch am Gegenstande selbst. Dadurch bekommt diese Stelle etwas Gewaltsames in der Abbildung und fällt aus der Harmonie des Ganzen heraus. Ich habe dies bei den photographischen Aufnahmen und der zeichnerischen Wiedergabe des Ehringsdorfer Kiefers erfahren und finde es durch Abbildungen der Literatur bestätigt. Eine weitere Erschwerung liegt darin, dass Gipsabgüsse die Feinheiten nicht wiedergeben. Ich beschränke mich daher hinsichtlich anderer diluvialer Kiefer auf die Bemerkung, dass Spinabildungen solchen nicht völlig fremd sind, wie die unpaare mediane Crista bei Krapina H. zeigt, und auf die Wiedergabe der Bemerkung von Boule, Annales de paleontol. T. 6—8 1911—13, S. 89, über das Skelet von La Chapelle-aux-Saints, dass dessen Area muscularis 'de fortes saillies pour l'insertion des muscles génioglosses et génio-hyoidieus' habe."

nämnda. Toldt har också ingående behandlat förekomsten av denna fossa. En dylik anger han såsom en insänkning av hela området för area genioglossi, som formar sig till en väl avgränsad grop med rund kontur. Bland de 230 barnkäkarna fann Toldt endast 2 gånger en fossa genioglossi, bland de 500 fullvuxna individernas underkäkar 6 gånger och bland dessa egendomligt nog 3 gånger hos de 35 fornnubiska kranierna. Toldt lämnar å sid. 258 anf. arb. en illustration av en sådan fossa från en av de fornnubiska käkarna från kyrkogården El Kubanieh. Den är av helt annan

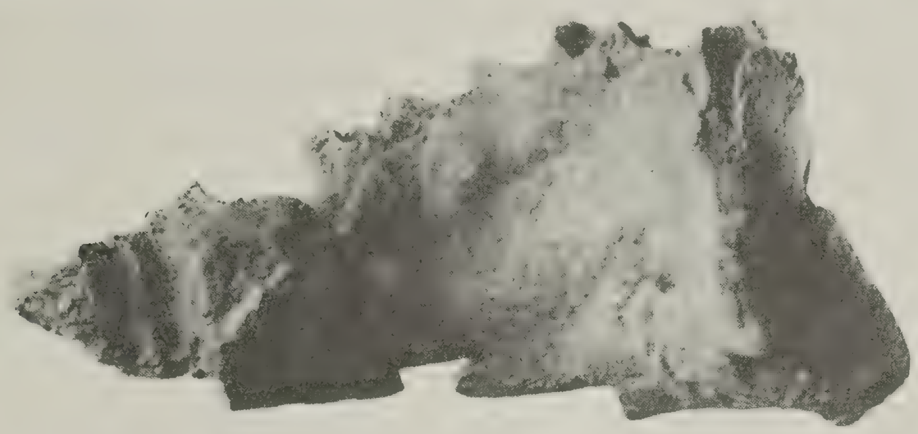

Fig. 7. Underkäksfragment från Hönsehals, sett snett bakifrån. Foto 1/1.

karaktär än den fotografiska bild, jag lyckats erhålla av sværdborgkäken (se fig. 6), en bild, som lyckligen återger den av Nielsen som en sådan märkvärdighet framhållna lilla gropen å svärdborgkäken. Toldt vill ej medgiva, att bland de efter Nielsen å sid. 383 anförda käkarna en *fossa genioglossi* finnes utbildad mer än hos käken från La Naulette och den från Mauer vid Heidelberg. Å sid. 260 säger han: “Von den altdiluvialen Unterkiefern besitzt, wie bekannt, der von La Naulette eine ausgezeichnete, wenn auch nicht sehr tiefe Fossa genioglossi, viel breiter und auch tiefer ist diese an dem Unterkiefer von Mauer; an keinem anderen findet sie sich in typischer Ausprägung“. Och fortsätter han: “Was das Verhalten der Muskelursprungsstellen betrifft, so kommen auch an den altdiluvialen Unterkiefern jene Formen, welche bei den rezenten Menschen die gewöhnlichen sind, vor, und zwar sind auch bei ihnen die Variationen in der *Area genioglossi* viel bedeutender als wie in der *Area geniohyoidei.*

Därefter övergår Toldt till att behandla variationerna inom area genioglossi hos Krapina-underkäkarna. Beträffande underkäken från La Chapelle-aux-Saints säger Toldt å sid. 260: “Auch an

dem Unterkiefer von La Chapelle-aux-Saints sowie an dem von Malarnaud tritt in der Mitte der *Area genioglossi* eine gut ausgebildete Leiste vor, welche mit einem ganz niederen Leistchen der Area geniohyoidei zusammenfliesst. Die Ursprungsstellen des entsprechenden Muskelpaares sind an dem ersteren durch scharf vortretende, in die Länge gezogene Höckerchen gekennzeichnet.“ Då H. A. Nielsen citerar Boule bl. a. som sagesman för sina uppgifter angående saknaden av spina genioglossi hos de “paleolitiska“ käkarna, ber jag ur dennes bekanta verk, Les Hommes Fossiles, sid. 208, få anföra hans uttalande om underkäken från La Chapelle-aux-Saints. “Nous retrouvons ici, à un dégré atténué, la fossette génienne que nous avons observée, sur la machoire de Mauer et qui est encore plus profonde chez les Singes. Mais il y a de belles apophyses géni supérieures et inférieures, tout comme chez les Hommes modernes.“ Jag övergår till att anföra, vad H. Virchow säger om Ehringsdorferkäkarna i sitt ovan citerade arbete. Han framhåller å sid. 50: “Hinsichtlich der *Area muscularis* (Area genioglossi och Area geniohyoidei slagna ihop till en area) gleicht der Ehringsdorfer weder genau anderen Diluvialen noch Rezenten noch Anthropoiden. Man darf daher auf ihn nicht eine Vorstellung übertragen, die man schon fertig mitbringt. Wir haben ein einheitliches Feld vor uns, in welchem sich Abteilungen für die Ggl.[1]) und für die Gh.[2]) nicht unterscheiden lassen. Wir bezeichnen es mit Schwalbe als fünfeckig und zerlegen es, um es anschaulich zu machen, in ein oberes Dreieck und ein unteres Viereck. Das Dreieck würde den Ggl., das Viereck den Gh. entsprechen. Das Dreieck ist gleichseitig. Unmittelbar oberhalb desselben liegt ein kleines trichterförmiges Grübchen, eine *Fossula supraspinata* (Rud. Virchow), in deren Grunde man zwei Venenlöcher hart nebeneinander, durch ein ganz feines Septum getrennt, wahrnimmt.“

Vi ha redan i ett citat från Toldt omnämnt underkäken från

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[1]) Ggl. = ursrungsfälten för musculus genioglossus.
[2]) Gh. = — - — geniohyoideus.

La Naulette, vilken skulle äga en utpräglad om också icke särskilt djup fossa genioglossi. Det har stått mycken strid om huru area genioglossi för övrigt är utbildad hos denna underkäke. Efter G. Sergi (i en uppsats: La mandibola umana)[1]), torde Topinard, som har studerat originalfragmentet noggrant och publicerat sina rön i Revue d'Anthropologie[2]), ha riktigast uppfattat de omstridda förhållandena. Sergi citerar efter Topinard förhållandena angående spina mentalis interna på följande sätt: "Les apophyses géni supérieures contrairement à tout ce qui a été imprimé y existent sous la forme de deux petites cupules cote à cote parallelement, un peu déprimées dans leur ensemble ....." Sergi tillfogar, att underkäken från La Naulette i detta hänseende icke faller utom gränserna för variatîonen hos "nystenalderns" och nutidens underkäkar.

Vi övergå nu till den av Fraipont og Lohest beskrivna underkäken från Spy I, som Sergi i likhet med ovannämnda forskare finner likna underkäken från La Naulette. På hakans insida ha vi i mitten ett foramen med en föga djup fossula supraspinata. Sergi framhåller, att han funnit liknande förhållanden hos recenta underkäkar. Han avbildar å sid. 125 en underkäke av nutida italienare från Bologna, där ett liknande ovalt foramen med en fossula utan spår av spina genioglossi finnes. Sergi lämnar för övrigt i sin ovan nämnda uppsats många exempel på utbildningen av area genioglossi i form av en fossula, mer eller mindre djup, med eller utan spår av spina resp. spinae genioglossi. Undersökningen omfattar underkäkar dels från förhistorisk och tidigt historisk tid i Italien, dels från recenta europeiska och utomeuropeiska folkslag. Tio illustrationer av det här berörda inre hakpartiet erbjuda ett utmärkt jämförelsematerial till min figur 6, återgivande förhållandena å sværdborgkäkens insida. Det har uppstått diskussion emellan Sergi och Toldt om huruvida, som Sergi påstår, fossa genioglossi är att anse som en utvidgning av fossula supraspinata. Toldt säger i ovan anförda arbete (sid. 259), att fossula supraspinata "ist nichts anders als eine Ausweiterung des Zuganges zu dem medianen Ernährungskanal des Unterkiefers, während die *Fossa genioglossi* sich als gru-

1) Rivista di Antropologia, vol. XIX, 1914, p. 136.

2) 3 Ser., T. I, 1886, p. 423. (Les caracteres simiens de la machoire de La Naulette.)

bige Einsenkung des Gesamtgebietes der betreffenden Area, der Muskelursprungsstellen und des oberen Ernährungsloches, darstellt.“ Hans Virchow har i ovan anförda arbete å sid. 49 tagit ställning emot Toldt. Då detta arbete är ett av de sista på detta område och då författaren är känd för sina skickliga dissektioner, vill jag här citera Virchow's uttalande in extenso:

“Das oben angegebene Verhalten, bei welchem sich beim Menschen eine mediane Grube findet, was Toldt in einer Anzahl von Fällen beobachtet hat und was auch ich gesehen habe, hat diesen Autor Veranlassung geboten, auch beim Menschen von einer “*Fossa genioglossi*“ zu sprechen und diese der von ihm ebenso genannten Grube bei Anthropoiden, meiner Excavatio intertorica, gleichzusetzen. Dies ist jedoch ein Irrtum, denn diese Grube enthält nicht die Ursprungsfelder der *Genioglossi*, sondern liegt über ihnen. Eine morphologische Beziehung zwischen beiden besteht gleichwohl. Die Grube ist eben der obere Abschnitt der Nische, derjenige, welcher das Gefässloch bzw. die Gefässlöcher enthält, ist also im wesentlichen doch die “*Fossula supraspinata*“ von Rud. Virchow in vergrösserter Form.“

Slutligen böra vi något beröra den av H. A. Nielsen omnämnda käken från Mauer vid Heidelberg. Å sid. 260 säger Toldt härom:

“An dem Unterkiefer von Mauer sind diese Verhältnisse wegen der in der Mitte durchlaufenden Bruchlinie einigermassen gestört, jedoch lässt sich an dem Originale so viel feststellen, dass der Ursprung des Musculus genioglossus durch ein jederseits an der unteren Umgrenzung der *Fossa genioglossi* vortretendes rundliches Höckerchen und eine von diesem aus nach oben in die Grube hineinziehende flache Rauhigkeit gekennzeichnet ist, während die Area geniohyoidei an der Unterseite des die Grube begränzenden Querwulstes als flaches, schief nach unten gekehrtes, oblonges Feld erscheint, welches seitlich durch eine deutliche Furche begrenzt und in der Mittellinie mit einem niederen, stumpfen Leistchen ausgestattet ist. In bezug auf die Formen dieser Muskelursprungsstellen, sowie auch der für den *Musculus digastricus* verhält sich daher der Unterkiefer von Mauer durchaus nach Art des Menschen.“

Däremot vill Toldt, som nyss nämnts, i den djupa utbildningen

av area genioglossi se en rent aplik (pitekoid) karaktär, vilket Sergi förnekar. Denne (*Sergi*) säger i sitt ovan anförda arbete (sid. 135), att fossa genioglossi å heidelbergerkäken motsvarar, vad *Virchow* kallat fossula supraspinata. Man återfinner i denna fossa som vanligt ett foramen ovanför spina mentalis, fortsätter *Sergi*, som erkänner, att denna fossula supraspinata hos heidelbergerkäken är ovanligt stor, men att han hos en underkäke av en fullvuxen kvinna från Eldslandet funnit en dylik fossa, som är något mindre men fullkomligt identisk, med foramen supraspinatum och därunder spina. Även å tvenne andra käkar från Eldslandet finner *Sergi* likheter med heidelbergerkäken härutinnan, och han avslutar sitt omdöme om denna med att säga, att utbildningen av en sådan fossa är en karaktäristisk och mycket sällsynt företeelse. Vi hava däri icke att se en aplik karaktär utan en bildning, som man kan definiera såsom en variation, så mycket mera som vi hos underkäken från Mauer finna en väl utvecklad spina mentalis, som utgör ursprungsfälten för den pariga musculus genioglossus, under det att en rundad upphöjning gör samma tjänst åt den likaledes pariga musculus geniohyoideus. Så långt Sergi.

Hur pass sällsynt dock fossa genioglossi är å svenskt material från fullvuxna individer framgår därav, att jag å Lunds Anatomiska Institution *genomgått över 1000 underkäkar av fullväxta individer* från Lunds medeltid samt *ej en enda gång funnit någon fossa genioglossi* eller därmed likvärdig bildning. Bland ett 50-tal svenska underkäkar från järnåldern fann jag endast *en gång en fossula* av samma typ som heidelbergerkäken. Denna underkäke härrörde ifrån Limhamn, där den funnits i en grav tillhörande tiden 200—500 e. Kr. Fossan var mycket tydlig ehuru ej fullt så djup som på käken från Mauer. Tvenne tydliga spinae genioglossi funnos nedanför fossulan, som var försedd med det sedvanliga ovala foramen spinosum. Därnedanför fanns en hopklämt Y-formig spina geniohyoidei. Från Lunds medeltid fanns ett 60-tal barnunderkäkar. *Här funnos icke mindre än 5 stycken*, vilka hade en tydlig fossula utvecklad snarare i riktning mot förhållandena hos heidelbergerkäken än mot sværdborgkäken (som ju endast företer en obetydlig grop, till på köpet med spår av spinae genioglossi). Av 15 stycken underkäkar från fullvuxna eskimåer företedde *en* underkäke en mycket vacker fossa lik heidelbergerkäkens men utan spår

av spina. I tvenne fall var en mindre fossula med tydliga, relativt väl åtskilda spinae tillfinnandes.

Prof. Gaston Backman har under titeln "Typologiska studier över spina mentalis interna hos människan"[1]) publicerat en undersökning av bland annat 203 underkäkar av indianer från gravar i Bolivia och Peru och därvid meddelat åtskilligt av intresse, vilket jag dock här förbigår, då det ej direkt hör samman med denna fråga.

Däremot anser jag mig skyldig att referera Otto Schlaginhaufen's iakttagelser och resonemang angående några med H. A. Nielsen's fynd analoga förhållanden. I Archives suisses d'Anthropologie générale[2]) under titeln "Die menschlichen Knochen aus der Höhle Freudenthal im Schaffhauser Jura" har han bl. a. beskrivit en nästan fullständigt bibehållen underkäke av ett c:a fem års barn med en tydlig fossa genioglossi. Han säger härom å sid. 285: "Die *Fossa genioglossi*, die als zweites Merkmal "(Ett planum alveolare med index 60,07 utgjorde den första här åsyftade primitiva karaktären)" an der Innenfläche auffällt, senkt sich als geräumige einheitliche Grube unterhalb der gerundeten Zone an der Stelle ein, wo bei anderen Kiefern die Spina genioglossi ihre Lage hat. Rand und Boden der Grube sind glatt und zeigen nichts, was als Anlage einer Spina gedeutet werden könnte. Unterhalb der Grube ist eine Spina geniohyoidei ganz leicht angedeutet. Auch die *Fossa genioglossi* ist eine Bildung die beim Menschen der rezenten und der jüngeren prähistorischen Zeit äusserst selten auftritt und daher volle Beachtung verdient. Bekannt ist das Vorhandensein dieser Grube am Heidelberger-Unterkiefer und am Kiefer von La Naulette. Nach Klaatsch kommt sie beim Australier und nach Martin als ontogenetisches Stadium beim Einjährigen vor. Rasche[3]) meldet sie von einem Melanesier und einem rezenten Schweizer." H. Obermaier har betecknat skelettresterna von Freudenthal "als sicher quaternär", och han räknar dem till magdalénien. Enligt Schlaginhaufen's forskningar består det antropologiska ma-

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1) Hygiea, Stockholm 1916.

2) Tome III, no. 2, 3 och 4 (Geneve 1919).

3) Beiträge zur Anthropologie des Unterkiefers (aus dem Anthrop. Inst. der Universität Zürich, Inaug.-Diss., Zürich, 1913) p. 104. Fossa utan spina.

terialet av två olika kategorier, nämligen dels sådana med primitiv prägel och dels sådana som i sina karaktärer sluta sig närmare till de recenta européerna. Det är särskilt de förstnämnda s. k. primitiva resterna, som intressera oss i detta sammanhang, ty det här ovan omnämnda underkäksfragmentet företrädde utom den primitiva karaktär, som en verklig fossa genioglossi betecknar, även ett typiskt planum alveolare. Han säger i ovan anf. arb. å sid. 285 vidare: "Mag das Planum alveolare oder die glatte Fossa genioglossi jede einzeln für sich in seltenen Fällen beim rezenten Menschen vorkommen, die Kombination beider Merkmale in guter Ausprägung ist, soweit die heutigen Untersuchungen ergeben haben, auf die Frühzeit der menschlichen Prähistorie beschränkt; dagegen finden sich an den Objekten von Mauer, von La Naulette und von Freudenthal beide Bildungen zugleich an ein und demselben Stück." För övrigt är freudenthalerkäken en typisk käke för sin ålder (5 år). Den har ett tydligt hakframsprång utan spår av impressio subincisiva externa.

Jag har här uppehållit mig vid Schlaginhaufen's uppsats, därför att jag hos honom mött klarast utformad en tankegång, som även tycks finnas hos H. A. Nielsen. Båda mena att en i sig själv primitiv egenskap, som i sällsynta fall uppträder hos de nutida européerna, genom att åtföljas av en annan primitiv egenskap med samma undantagsställning i nutiden blir ett karaktäristikum, som tillhör enligt H. A. Nielsen paleolitiken eller för att tala med Schlaginhaufen "die Frühzeit der menschlichen Prähistorie". Båda lägga huvudvikten på kombinationen av tvenne primitiva egenskaper. Men medan Schlaginhaufen av allt att döma är på den säkra sidan, har jag genom den här ovan lämnade utredningen visat i ord och bild, att H. A. Nielsen's iakttagelser och slutsatser ej äro hållbara, och att sålunda de båda underkäkarna med hänsyn till utbildningen av hakframsprång och area genioglossi icke besitta några primitiva eller paleolitiska karaktärer, utan falla de härutinnan helt och hållet inom gränserna för underkäkens variationer hos nutidseuropéerna.

Nielsen har emellertid hos dessa underkäkar sökt påvisa ännu en primitiv egenskap, nämligen deras tandförhållanden, men jag skall i avdelning III söka visa, att ej heller här existerar något, som berättigar till att kallas primitiv karaktär.

III.

Å sid. 208 säger H. A. Nielsen: "Fremdeles har Sværdborg-underkjæben andre palæolithiske reminiscenser. Af tænder ere tilstede i venstre underkjæbegren de 2 små blivende bicuspidale skiftekindtænder, begge ganske som nutidens og den neolithiske tids tænder. Tillige findes den første store blivende molar; den er ret stor og kraftig og har 5 tandknuder, som ere lidt slidte på spidserne. Anden store blivende molar er også tilstede, men endnu ikke i slidplan; den har ligeledes 5 tandknuder. Bag anden store molar er kjæben brudt, og tredie store molar, som har ligget dybt i kjæben, er derved gået tabt og findes ikke mellem fragmenterne." Å fig. 8 framvisar jag en bild av denna "venstre underkjæbegren", vari

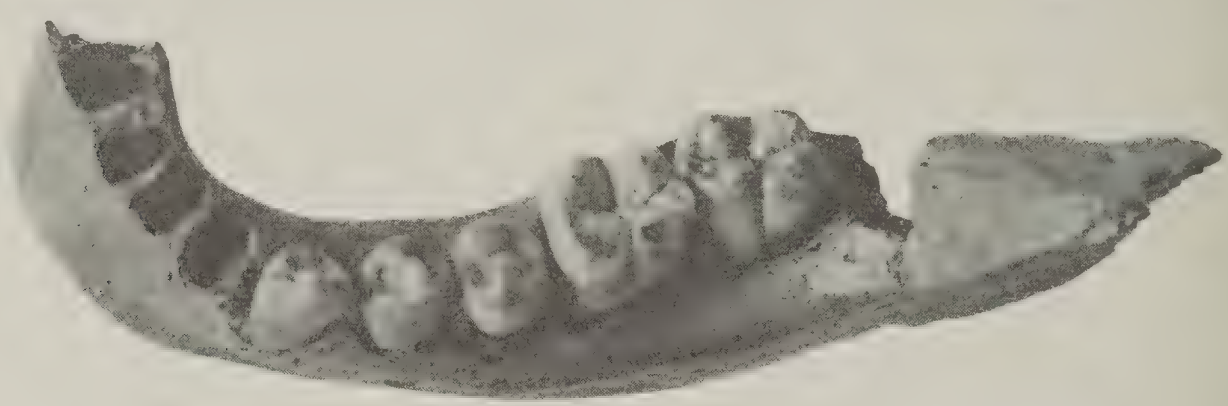

Fig. 8. Vänstra sværdborgfragmentet sett uppifrån. Första molaren med 5 „tandknuder", andra molaren med 4. Foto 1/1.

samtliga här omnämnda tänder presenteras plus en hörntand, som H. A. Nielsen ej omnämnt. Av den fotografiska bilden framgår något, som jag vid min första undersökning å detta underkäksfragment kunde konstatera, näml. att endast fyra "tandknuder" (tuberkler) funnos å den andra underkäksmolaren. Å profilen (fig. 1) synes tydligen, att den andra molaren liksom även andra premolaren ej hunnit fram till slitplanet. T. o. m. första premolaren hade knappast hunnit riktigt fram. Andra underkäksmolaren hade vid ett tillfälle lossnat; och vid försiktig manipulation kunde den tagas ut och mätas. Det visade sig då, att den ägde föga utbildade rötter och mätte en längd av 16,6 mm. (= tandens totala längd). På grund av dessa förhållanden torde H. A. Nielsen's uppskattning av underkäken såsom tilhörande en 16—18

års yngling vara väl högt tilltagen[1]). Med hänsyn till tandutvecklingen torde underkäksfragmentet ej ha tillhört en äldre individ än 14 år, en uppskattning, som bestyrkes vid studiet av övriga skelettrester, vilka tillvaratagits av sværdborgindividet. Nielsen fortsätter vidare å samma sida: "Af højre underkjæbegren er bevaret et fragment, som nåer fra tandgruberne for de 2 små skiftemolarer til noget bag første store molar, hvor kjæben er brudt; ved dette brud er den opstigende gren gået tabt sammen med den ydre, mod kinden vendende væg af den horizontale kjæbegren, medens den indre, mod tungen vendende væg ståer bevaret omtrent helt bagtil, hvor den opadstigende gren begynder. På denne resterende indervæg af højre underkjæbegren er der på den mod tænderne vendende flade bevaret begge rodkulisserne for 2den og 3die store blivende molar, af hvilke det ses, at anden store molar også på højre side har været fremme, ligesom at tredie store molar her har ligget dybt i kjæben.

Af tænder findes i højre underkjæbefragment endvidere rødderne til de 2 små bicuspidale skiftekindtænder siddende i deres rodhuler; kronerne ere brudte af. Desuden ses første store blivende molar med 5 svagt slidte tandknuder; tanden er stor og kraftig."

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[1]) Första permanenta molaren brukar ju kallas för 6-års-molaren. Andra molaren brukar i stil härmed kallas 12-årsmolaren. Se härom G. A. Haus, Speciel Tandanatomi (Kristiania 1917) sid. 185: „I almindelighed regnes de blivende tænders frembrud normalt at foregaa i følgende orden og alder. Den første af de blivende tænder, som bryder frem, er første molar, sexaarsmolaren, som kommer i 6-aarsalderen, først i underkjæven. Efterat denne tand er brudt frem kommer i 7—8-aarsalderen de centrale fortænder, først i underkjæven, herefter følger de laterale fortænder, først i overkjæven i 8—9-aarsalderen. I 9de—11te aar kommer første bicuspidat i overkjæven og fra 11te—13de aar anden bicuspidat og hjørnetænderne, de sidste først i underkjæven, medens anden bicuspidat først kommer i overkjæven. Hvilke af disse to tandgrupper, der først bryder frem er forskjellig. Fra 12—15-aarsalderen kommer anden molar — tolvaarsmolaren — først i underkjæven, og tredie molars — visdomstandens — frembrud sker meget senere, ofte først mellem 20de og 25de Aar, af og til først mellem 30te og 40de Aar, og i enkelte tilfælde kan den helt mangle." Se ock Edward H. Angle, Die Okklusionsanomalien der Zähne, 2. deutsche Aufl. (Berlin 1913) S. 17, Fig. 20 u. 21.

Det finns intet skäl att betvivla riktigheten av H. A. Nielsen's framställning i vad som ovan citerats. En blick på fig. 9 visar dessa förhållanden.

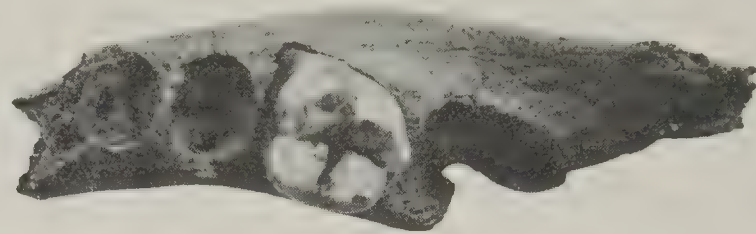


Fig. 9. Högra underkäksfragmentet från Særdborg, sett uppifrån. Foto $^1/_1$.

Att de första underkäksmolarerna ha fem "knuder" (tuberkler) är en fullständigt normal företeelse enligt en statistik, som här nedan skall meddelas. Att de äro svagt slitna är också naturligt, ty de ha gjort tjänst i 7—8 år. Å sid. 209 fortsätter H. A. Nielsen: "Bland de løse tænder i fundet foreligger en stor tand

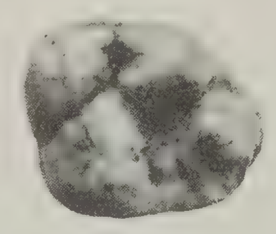


Fig. 10. Första vänstra överkäksmolarens krona. Foto $^{1,5}/_1$.

med 4 tandknuder og 3 spærrede rødder, hvilket viser, at den hører hjemme i overkjæben, ligesom dens store krone utvivlsomt siger, at den her er første store kindtand."

Å fig. 10 är denna överkäksmolarkrona fotograferad, och företer

Fig. 11. Första vänstra överkäksmolaren sedd från sidan. Foto $^1/_1$.

densamma genom anordningen av sina fåror (Furchen) den för överkäksmolarerna typiska H-formen. Ehuru tvenne av rötterna avbrutits, visar dock den tredje roten (se fig. 11), som kan sägas vara väl bibehållen, genom sin längd, att vi här ha att göra med

en första molar under förutsättning av att den tillhört samma individ som underkäken. Tandens totala längd utgjorde 24 mm. Att vi här ha att göra med en första övre molar framgår vid en jämförelse med vad, som i Mühlreiter's bekanta arbete omtalas[1]. "Das Charakteristische für diese Form liegt in dem Umstande, dass die Querfurche des H-förmigen Furchenkomplexes vollkommen ausgebildet ist, dass sie mithin den distalen Wangenhöcker von den mesialen Zungenhöcker ebenso scharf und kontinuierlich abtrennt, wie ein Teil der vorderen Längenfurche den genannten Zungenhügel von dem mesialen Wangenhöcker scheidet. Alle vier Hügel beteiligen sich in der gleichen selbständigen Weise an der Zusammensetzung der Kaufläche." Å sid. 87 sammanfattar han kännetecknen på följande sätt: "Ein den ersten oberen Mahlzahn stets charakterisierendes Moment ist ferner seine breite Zungenfläche[2]. Auch wenn sich an der letzteren kein Ansatzhügel ausbildet, erscheint die ganze linguale Kronenpartie fast konstant massiger und mehr in die Breite gezogen als die bukkale, und wird man dadurch allein schon in den Stand gesetzt, einen oberen Molarzahn mit ziemlicher Sicherheit als ersten zu diagnostisieren[2]." Helt visst har denna första överkäksmolar befunnit sig på vänster sida[3]. Däremot omtaler Nielsen tvenne lösa tänder, som han vill placera å höger sida i underkäken såsom resp. molar II och III, vilka jag ej kunnat finna bland de lösa tänderna i Nationalmuseets sværdborgfynd. Han säger i fortsättningen å sid. 209: "Fremdeles 2 store kindtænder med samlede rødder, altså kindtænder fra underkjæben, begge med 5 tandknuder. Den ene af disse kindtænder passer ind i den foran nævnte kulisse for anden store molar og viser sig knapt så meget fremme som anden store molar i venstre kjæbe-

[1]) Mühlreiter's Anatomie des menschlichen Gebisses. Vierte Auflage, bearbeitet von Th. E. De Jonge Cohen (Leipzig 1920) sid. 85.

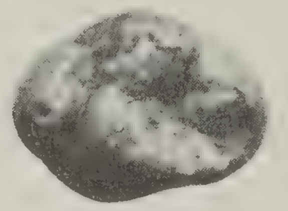
[2]) Spärr. av förf.

[3]) Vid mina besök å Nationalmuseet i Köpenhamn juli och aug. 1925 var denna tand utplockad från de övriga lösa tänderna och invirad i ett papper med uppgiften, att den var höger första överkäksmolar ("første blivende store overkæbekindtand, højre"), ehuru den var en otvetydig vänstermolar av motsvarande typ.

gren; den anden af de 2 løse underkjæbemolarer passer ind i lejet for den tredie molar, som foran er omtalt[1])."

Troligen har H. A. Nielsen velat i underkäken placera tvenne lösa överkäksmolarer med typisk H-form, vilka jag avbildar i fig. 12a och b[2]).

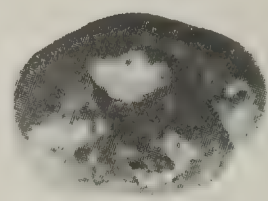
buccal

distal  mesial

lingual

Fig. 12a. Andra vänstra överkäksmolarens krona, sedd uppifrån. Foto 1,5/1.

buccal

mesial  distal

lingual

Fig. 12b. Andra högra överkäksmolarens krona, sedd uppifrån. Foto 1,5/1.

Å fig. 12a och b se vi dessa fotograferade från sidan. Rötterna svara ifråga om utvecklingsgrad fullständigt till det stadium, vi iakttagit hos den andra vänstra underkäksmolaren (se sid. 392 i denna uppsats). De mätte liksom denna en totallängd av 16 mm., och torde de därför placeras såsom vänster och höger andra överkäks-

lingual  buccal

Fig. 13a. Andra vänstra överkäksmolaren, sedd snett från sidan. Foto 1/1.

Fig. 13b. Andra högra överkäksmolaren, sedd från den buccala sidan. Foto 1/1.

molar (M_2 sup. sin. et dx.). Det framgår av alveolerna för molar II och III å höger sida i underkäken (såsom synes å fig. 14, vilken föreställer högra underkäksfragmentet från Sævrdborgs mosse, sett från sidan) att tänderna från fig. 12 och 13 omöjligen kunna placeras som undre molar II och III utan måste tillhöra samma åldersklass, om de överhuvudtaget tillhört sværdborgindividet. I fig. 9

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1) Spärr. av förf.

2) Vid mina ovannämnda besök å Nationalmuseet sommaren 1925 voro även dessa tänder utsöndrade från de övriga lösa och bestämda som femknöliga molarer (2 blivende store kindtænder med 5 tandknuder, højresidige).

sågo vi samma fragment fotograferat uppifrån. Där är molar I, som vi i båda fallen se kvarsittande, medan alveolen för molar II (kulisse for anden store molar enl. H. A. Nielsen) å fig. 14 synes i sin fulla längd och mätte ett djup av 11 mm., vilket skulle passa för en andra höger underkäksmolar, men som naturligtvis ingalunda kan göra tjänst för en andra höger överkäksmolar. Ännu mindre passar alveolen för den tredje underkäksmolaren till att göra tjänst för den andra överkäksmolaren (= lejet for den tredie molar enl. H. A. Nielsen), vilken mätte ett djup av c.a 8 mm. och motsvarar en mycket ung undre höger visdomstand (M_3 inf. dx.). Om man närmare studerar fig. 12a och b, visar det sig, att vi här ha att

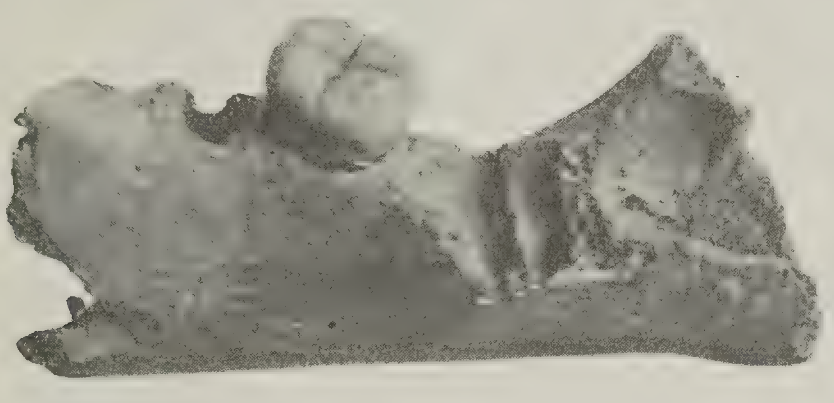

Fig. 14. Högra underkäksfragmentet från Særdborgs mosse, taget från insidan. Foto $^1/_1$.

göra med den ena av de två huvudformerna för andra överkäksmolaren. Mühlreiter säger härom å sid. 91: “Bei der ersten Hauptform besitzt die Krone vier Höcker und gleicht in der Hauptsache ganz derjenigen des ersten Molaris. Sie unterscheidet sich von demselben im Gebisse des nämlichen Individuums nur durch einen etwas kleineren distalen Zungenhügel und durch die verringerte Breite der Zungenfläche, welche derjenigen der Wangenfläche meistenteils schon etwas nachsteht; auch fehlt — ganz vereinzelte Fälle ausgenommen — selbst der schwächste Ansatz zu einem fünften Hügel. Die linguale Kronenhälfte hat das Übergewicht über die bukkale verloren.“ Ännu större blir likheten, om man jämför fig. 12b med Mühlreiters fig. 45B, däri han avbildar en modifikation hos den här nämnda ena huvudformen av andra överkäksmolaren. Det torde vara riktigast att återge Mühlreiter[1]) in extenso: “Ohne dass das typische Muster dieser Form

[1]) op. cit. p. 92.

(här ovan skildrad) geändert würde, macht sich gerade nicht selten noch eine Modifikation in der Weise bemerkbar, dass das normal schwach rautenförmige Viereck des Kronenquerschnittes noch mehr verschoben und zu einem stark akzentuierten Rhomboid ausgebildet wird." Som bekant är hos underkäkens molarer kvadratformen förhärskande. I Port-Eulers bekanta handbok[1]) formuleras detta sakförhållande så: "Während die Molaren in Oberkiefer im Kronenquerschnitt eher rautenförmig gestaltet werden, sind die unteren Molaren annähernd rechteckig gestaltet, wobei die langen Seiten des Rechtecks von der Wangen- und Zungenfläche gebildet werden. I fig. 8 och 9 å sid. 392 och 394 i denna uppsats ha vi vackra bilder av typiska underkäksmolarers kronor, som torde jämföras med överkäksmolarernas i mina fig. 12a och b för att demonstrera de här ovan efter Port-Euler framhållna och bland anatomer väl kända sakförhållandena.[2]) Å sid. 212 säger H. A. Nielsen nedtill i en not: "Foruden de her og i det foregående omhandlede skeletdele fandtes på samme sted i Sværdborg Mose følgende små knogler og knoglefragmenter, utvivlsomt også henhørende til Sværdborgmanden:[3]) af tænder foruden de 3 foran nævnte" (kindtänder från överkäken, näml. de här omtalade: första överkäksmolaren på vänster sida (M_1 sup. sin.) samt höger och vänster andra överkäksmolar (M_2 sup. sin. et dx.). "2 ‚første fortænder‘, (= 2 . I_1), 4 ‘anden fortænder, (= 4 . I_2), 2 hjørnetænder (2 . C) og 2 små bicuspidale skiftekindtænder." (Nielsen menar härmed 2 premolarer; altså 2 . P. Jmf. Nielsen citerad av mig sid. 392.) Av de lösa tänder, som H. A. Nielsen här uppräknat, åter-

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1) Lehrbuch der Zahnheilkunde von Port und Euler 2. u. 3. Aufl., herausgegeben von Prof. Dr. Euler (München und Wiesbaden 1920) sid. 149.

2) Man brukar även ha god nytta av regeln, att fårorna på överkäkens fyra främre permanenta molarer bilda ett snett liggande H, under det att de på underkäkens fyra bakre permanenta molarer bilda ett kors eller plus (+). I mina figurer 8, 10, 12a och b samt 24a få vi dessa karaktäristika var för sig verifierade.

3) Nielsen nämner här först en del benrester av mindre intresse. (Se för övrigt Winges benbestämningar å sid. 409 i denna avhandling.)

fann jag å Nationalmuseet höger och vänster första incisiver i underkäken (I_1 inf. sin. et dx.) (se fig. 15).

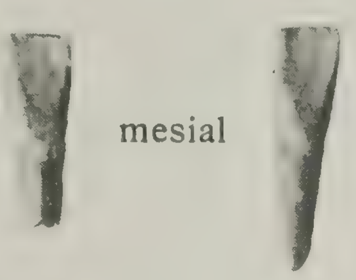

Fig. 15. Vänster (avbruten) och höger undre första incisiver (sedda inifrån). Foto $^1/_1$.

Vidare högra andra underkäksincisiven (I_2 inf. dx.) (se fig. 16).

Fig. 16. Högra andra undre incisiven. Foto $^1/_1$.

Av överkäksincisiverna anträffades höger första incisiv (I_1 sup. dx.) (se fig. 17)

Fig. 17. Höger första överkäksincisiv. Foto $^1/_1$.

och vänster andra incisiv (I_2 sup. sin.) (se fig. 18).

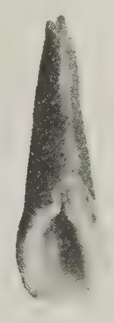

Fig. 18. Vänster andra överkäksincisiv. Foto $^1/_1$.

Om vi alltså slå ihop över- och underkäksframtänder, få vi alltså tre första incisiver ($3 \cdot I_1$) och två andra incisiver ($2 \cdot I_2$),

alltså överensstämma mina bestämningar ej med H. A. Nielsen's. Av hörntänder fann jag en höger underkäkshörntand (C inf. dx.) (fig. 19).

Fig. 19. Höger underkäkshörntand. Foto $^1/_1$.

och en vänster överkäkshörntand (C sup. sin.) (se fig. 20),

Fig. 20. Vänster överkäkshörntand. Foto $^1/_1$.

alltså två "hjørnetænder" (2 . C), såsom H. A. Nielsen angivit. Av premolarer fann jag en höger främre underkäkspremolar med avbruten rot (P_1 inf. dx.) (se fig. 21),

Fig. 21. Höger första underkäkspremolar. Foto $^1/_1$.

och från överkäken tvenne högerpremolarer, resp. främre och bakre (P_1 sup. dx. + P_2 sup. dx.) (se fig. 22).

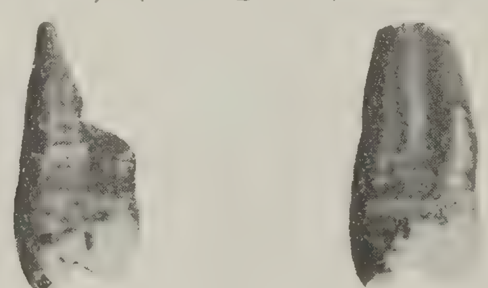

Fig. 22. Första och andra premolaren från högra sidan av överkäken. Foto $^1/_1$.

Vi få alltså inalles tre "bicuspidale skiftekindtænder", ej två, såsom H. A. Nielsen påstått (3 . P). Vänstra främre underkäksincisiven (I_1 inf. sin.) är avbruten, som ovan framhållits; likaledes framhölls

att höger första underkäkspremolar (P_1 inf. dx.) var avbruten och synes passa samman med den avbrutna rotändan i alveolen för höger första premolar (se fig. 9). Av ovanstående framgår, att H. A. Nielsen's redogörelse för de lösa tänderna varit högst bristfällig, och att några lösa underkäksmolarer ej finnas. Däremot fann jag samma antal lösa tänder, som H. A. Nielsen uppgivit, nämligen 13 inalles.

H. A. Nielsen har trott sig iakttaga 5 tandknölar på dessa överkäksmolarer (fig. 12a och b), som äro typiskt 4 knöliga, och ur dessa oriktiga sakförhållanden drar han följande slutsats å sid. 209: "Her er altså i højre underkjæbegren — og har derfor utvilsomt også i venstre været — 5 tandknuder på alle 3 molarer. Som et ejendommeligt træk skal endvidere nævnes, at den 3die store underkjæbemolar er større end den anden og forfra bagtil længere end den første." Ehuru det kan synas onödigt att ingå på diskussion om dessa överkäksmolarer, som H. A. Nielsen velat placera i underkäken, så tycker jag likväl, att prof. Nielsens generella påstående[1]) om att "i neolithiske och og nutids underkjæber er den tredie store molar derimod altid den mindste", och att "dette er det tredie palæolithiske fænomen ved Sværdborgunderkjæben", icke kan få passera oemotsagt[2]). Men viktigare är att H. A. Nielsen genom att placera dessa överkäksmolarer i underkäken såsom högersidiga

[1]) op. cit. sid. 209.

[2]) Rud. Martin, anf. arb. sid. 885 yttrar sig om de "paleolitiska" människornas tänder på följande sätt: "Die Zähne des altdiluvialen Menschen, vor allem diejenigen von Mauer und Le Moustier, sind im allgemeinen gross, aber sie fallen doch durchaus in die Variationsbreite des rezenten Menschen. Die so charakteristische von M_1 zu M_3 fortschreitende Abnahme der Zahngrösse ist auch bei ihnen meist schon vorhanden; und auch im Kauflächenrelief ist seit dem Diluvium keine wesentliche Änderung eingetreten". Se ock Sergi, op. cit. p. 137, där det framhålles, hurusom Virchow ansett, att den från M_1 inf. till M_3 inf. tilltagande storleken är (icke, såsom H. A. Nielsen menar, ett paleolitiskt fenomen utan rent av) en aplik — pitekoid — karaktär. Denna uppfattning är. menar Sergi, numera övergiven, emedan hos recenta människor av alla raser detta sakförhållande kan konstateras, under det att hos käken från Mauer M_3 icke är den största av molarerna. Sergi hänvisar för övrigt till M. de Terra, Beiträge zu einer Odontographie der Menschenrassen (aus dem Anthrop. Institut der Universität Zürich), Parchim i M. 1905, vari det ges vidare belägg för hans åsikter. De Terra har

molar II och III får fram, att den sista underkäksmolaren är större än den andra och längre än den första (se citat av H. A. Nielsen här ovan: "Som et ejendommeligt træk" o. s. v.). Än egendomligare är dock H. A. Nielsen's resonemang över knöligheten hos underkäksmolarerna. Han fortsätter å sid. 209: "Hos nutidsmennesker viser der sig ret store variationer for de 3 store blivende underkjæbemolarers vedkommende, idet første store underkjæbemolar hyppigst har 5 tandknuder, men også ofte 4; anden store molar angives næsten altid at have 4 tandknuder, men her tillands har den ofte 5. Tredie store molar har i reglen 4 tandknuder, men er den mest varierende af alle tænderne i nutidskjæben; man finder ofte 3 eller endog kun 2 og, om end sjældnere, indtil 6 knuder. Men 5 tandknuder på alle 3 store molarer i underkjæben træffes ellers kun i underkjæber fra palæolithisk tid og hos australnegere.[1]) Endnu skal angående tænderne tilføjes, at den 5te tandknude såvel i palæolithiske som i senere tiders kjæber stedse er mindre end de andre og er skudt ind mellem 2 af de større knuder." Innan vi gå vidare, vill jag först påpeka, hurusom "den 5te tandknude" H. A. Nielsen omtalat, alltid "er skudt in mellem 2 af de større knuder", distalt mellan de två bakre "tandknuderne". Vi få då i enlighet med vad som omtalas överallt i handböckerna 3 buccala och 2 linguala tuberkler. Vad återigen själva sammansättningen av de trenne underkäksmolarernas knölar (tuberkler, på tyska Höcker eller Hügel) beträffar, har Zuckerkandl givit följande statistik, som jag ur Mühlreiter's Anatomie des menschlichen Gebisses[2]) ber att få anföra.

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bl. a. undersökt 24 käkar av schweizare från förhistorisk resp. tidig historisk tid. I 3 fall har han kunnat konstatera, att M_2 inf. är större än M_1 inf. och att M_3 inf. är den största av alla 3 molarerna. (Se de Terra op. cit. sid. 9 och 204.)

[1]) Detta påstående är felaktigt. Icke blott hos australnegrerna utan även hos andra utomeuropeiska raser ja t. o. m. hos nutidseuropéer kan en genomgående femknölighet förekomma. Se nästa sida: Jmf. ock: K Gorjanovic-Kramberger, Der Unterkiefer des Eskimos als Träger primitiver Merkmale, Sitzungsber. d. Preuss. Akad. d. Wissenschaften 1909 II, p. 1291 f.

[2]) op. cit. p. 135 f.

Hügelkombination			bei Europäern	bei Nichteuropäern
M. I	II	III		
5	4	4	in 50,5 %	in 30,4 %
5	4	5	„ 30,5 „	„ 25,5 „
5	**5**	**5**	„ **11,5** „	„ **32,8** „
5	4	3	„ 1,7 „	„ 0,5 „
4	4	4	„ 1,7 „	„ 0,5 „
5	5	4	„ 1,1 „	„ 9,3 „
4	4	5	„ 1,1 „	„ — „
4	4	3	„ 0,6 „	„ — „
6	5	6	„ 0,1 „	„ — „

En för européerna åtskillig högre procent för genomgående 5-knölighet hos molarerna angives därsammastädes å sid. 136 i en statistisk sammanställning, gjord av Röse:

Hügelkombination			bei Europäern	bei Nichteuropäern
M. I	II	III		
5	4	4	in 40,4 %	in 21,3 %
5	4	5	„ 30,4 „	„ 30,0 „
5	**5**	**5**	„ **19,8** „	„ **30,8** „

Av ovanstående framgår, hurusom t. o. m. en genomgående 5-knölighet hos underkäksmolarerna icke kan räknas såsom ett "paleolitiskt" fenomen, särskilt, när de båda andra primitiva karaktärerna, som avhandlats under avdeln. I och II, icke förefinnas. Vad alltså nu till sist swærdborgkäkens tänder angår, så äro dessa korrekt fördelade på över- och underkäke av sådan art, att de helt och hållet falla inom nutidseuropéernas mest typiska variationer. Vi övergå härmed till tandförhållandena hos mullerupkäken.

Om denna säger H. A. Nielsen å sid. 216: "Denne underkjæbe, som er lille og spinkel, er ligesom Sværdborg-underkjæben brudt i 2 stykker fortil, og venstre underkjæbehalvdel har også i forbindelse med sig de 2 fortandsgruber fra højre kjæbehalvdel. Venstre kjæbehælvt er atter brudt lige bag første store blivende molar, som er helt fremme, men kun yderst lidt slidt og viser, at kjæben hidrører fra et 7—8 år gammelt barn." Å sid. 217 fortsätter han

om det vänstra underkäksfragmentet: "Første store molar er, som nævnt, tilstede; den har 5 kraftige tandknuder med en enkelt svagt slidt spids. Men desuden har venstre underkjæbegren foran den første store molar sine 2 små skiftekindtænder endnu uskiftede på plads[1])", og begge vise de sig at have 5 store og tydelige, om end stærkt slidte tandknuder." Jag har sammanfogat de här nämnda båda underkäksfragmenten till ett och tagit en bild, som visar att första molaren på vänster sida (M_1 inf. sin.) har 5 tuberkler, liksom den andra lakteala underkäksmolaren (m_2 inf. sin.) på samma sida. Den första lakteala underkäksmolaren på samma sida (m_1 inf. sin.) (se fig. 23) är mycket sliten; den synes dock ha endast fyra

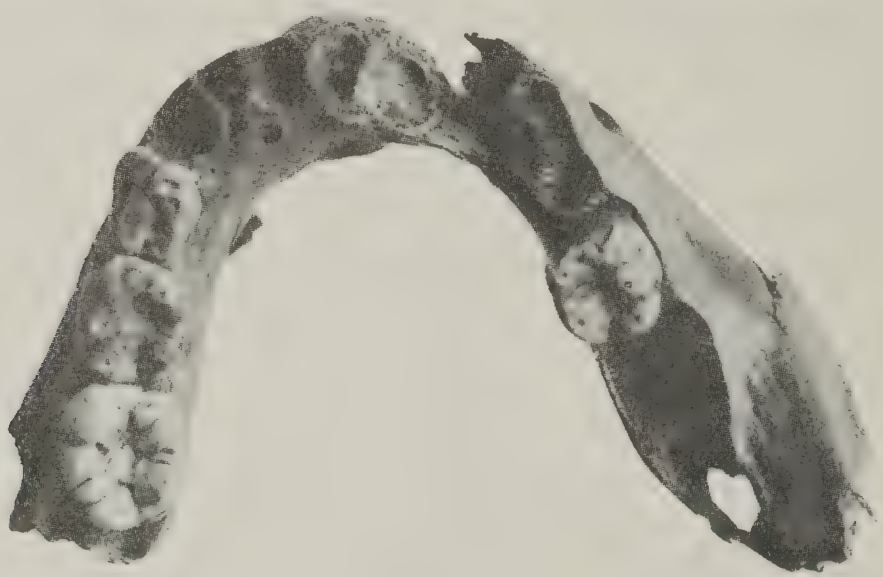

Fig. 23. Högra och vänstra underkäksfragmenten från Maglemose, fotograferade uppifrån. Foto $^1/_1$.

knölar. Tuberculum molare är kraftigt utbildad såsom typiskt för denna tand. Normalt är, såsom i Mühlreiter's ovan nämnda arbete framhålles å sid. 186, fyra likaväl som fem tandknölar å den första lakteala molaren. Det är så mycket viktigare att framhålla detta faktum, som H. A. Nielsen i fortsättningen å samma sida gör följande uttalande: "Angående mælketænder i fortidskjæber har jeg ingen oplysninger kunnet finde; de synes ikke tidligere at være påagtede. Ved nutids børnekjæber synes alle enige om, at den første lille mælkemolar har 3 eller 4, og den anden lille mælkemolar 5 tandknuder. Men det fremhæves af nutids anatomer, at de små skiftemolarer, hvad kronens og røddernes bygning angåer, afspejle de blivende tænder i den rækkefølge, hvori de stå i kjæben. Hvis så var ligeledes i

[1]) Nielsen menar härmed 2 mjölkkindtänder = lakteala molarer (m_1 inf. + m_2 inf.). Jmf. nedan!

den tid, der her omhandles, da har Mullerupkjæben med fuld ret måske sine 5 knuder på anden store molar — hvorom strax nedenfor —; men 5 knuder på første,[1][2]) må da i tilslutning til den manglende hageprominens og manglende crista genioglossa siges at være et palæolithisk fænomen.“ Man kan nog finna ett och annat inom litteraturen angående “mælketænder i fortidskjæber“, men vi skola icke uppehålla oss därvid. Angående tandförhållandena i nutida barnkäkar äro däremot alle eniga om, att första lakteala underkäksmolaren icke har tre eller fyra knölar utan vanligen fyra men även fem tuberkler. I Port Euler's handbok säges det om den första lakteala underkäksmolaren, att den med sina fyra knölar liknar den andra permanenta underkäksmolaren. I Mühlreiter's ovan citerade handbok framhålles det om första lakteala underkäksmolarens ställning följande å sid. 187: “Aus der Vergleichung des ersten unteren bleibenden Prämolaris mit seinem Vorgänger im Milchgebiss ergibt sich die schon oben hervorgehobene Tatsache, dass die Gestalt des letzteren eine ganz bedeutend abweichende ist und selbst mit einzelnen Varietäten des ersteren fast gar keine gemeinsamen Züge besitzt. Da der in Rede stehende Milchzahn überhaupt mit keinem Zahne im bleibenden Gebisse des Menschen Ähnlichkeit hat, in demselben also unvertreten ist, wird er evident zu einer eigenen Zahnindividualität gestempelt.[1]) Vidare referera Mühlreiter och De Jonge Cohen Zuckerkandl's åsikter om m_1 inf. “Nur Zuckerkandl hat für den Milchbakkenzahn die Bezeichnung als Mahlzahn noch beibehalten, erklärt es übrigens für vergeblich, denselben in das Schema irgend einer Zahnsorte einreihen zu wollen. Jedenfalls läuft seine ganze daran geknüpfte Argumentation darauf hinaus, dass diesem Zahn die Merkmale eines Molaren völlig fehlen.“

Övergå vi till att behandla den andra lakteala underkäks-

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1) Spärr. av förf.

2) Här tycks ett tryckfel föreligga. 5 tandknölar på första permanenta underkäksmolaren är ju det normala: se citat från H. A. Nielsen anf. arb. sid. 209 och Mühlreiter's och Röse's statistiska sammanställningar (citerade å sid. 403 i denna uppsats).

molaren, så står det i Port Euler's handbok om denna tand, att dess krona liknar med sina fem knölar så fullkomligt den första permanenta molaren, att en vidare beskrivning därav är onödig. Mühlreiter säger också härom (å sid. 190 anf. arb.), att den andra lakteala underkäksmolaren (m_2 inf.) representerar det original, av hvilken den bakom honom följande permanenta molaren (M_1 inf.), när den är typiskt utbildad, framställer en förstorad kopia. De fem knölarna äro noggrant så ställda som hos den första permanenta molaren. Sammanfatta vi den gällande uppfattningen angående mjölkkindtänder och äkta kindtänder i underkäken, så framgår härav, att mullerupkäken har fyra knölar normalt utbildade å den vänstra första lakteala underkäksmolaren (m_1 inf. sin.) på ett sätt, som påminner om den typiska andra permanenta underkäksmolaren (M_2 inf. sin.). Därför kan den 4-knöliga m_1 inf. sin. icke tagas till intäkt för någon blivande femknölighet hos M_2 inf. sin., vilken troligen varit 4-knölig. Vi skola strax återkomma härtill.

Jag övergår nu till att behandla det högra underkäksfragmentet från Mullerup. H. A. Nielsen säger härom å sid. 217: "Av højre underkjæbehælvt er tilstede midtpartiet fra anden lille skiftemolar til lidt bag første store molar. Den tilstedeværende anden lille skiftemolar er ret stor og har som i venstre kjæbehælvt 5 tydelige tandknuder. Første store blivende molar er udfalden og mangler, og noget bag dens rodhule er kjæben avbrudt lige bag anden store molars plads. Anden store molar har ikke været fremme, men skimtes i brudet fra oven, liggende endnu ret dybt i kjæben. Men fra neden ses tanden tydelig liggende i sin hule, og ved forsigtige manipulationer lykkedes det at få tanden drejet således, at tandknuderne kom frem; det viste sig da, at der var 5 tandknuder."[1]) Vad som här säges om "den anden lille skiftemolar", överensstämmer med min fotografiska bild (se fig. 23). Likaledes är det tydligt, att den första högra permanenta underkäksmolaren saknas. Däremot är den av H. A. Nielsen såsom femknölig omtalade andra högra permanenta underkäksmolaren (M_2 inf. dx.) typiskt fyrknölig, såsom framgår av fig. 24 a, där dess

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[1]) Spärr. av förf.

krona är fotograferad bredvid dess alveol. I fig. 24 b se vi samma tand ifrån sidan. Troligen har därför även M_2 inf. sin. varit fyrknölig. Att M_2 inf. är fyrknölig, stämmer ju också med de vanliga förhållandena hos recenta européer (se Mühlreiters statistik här

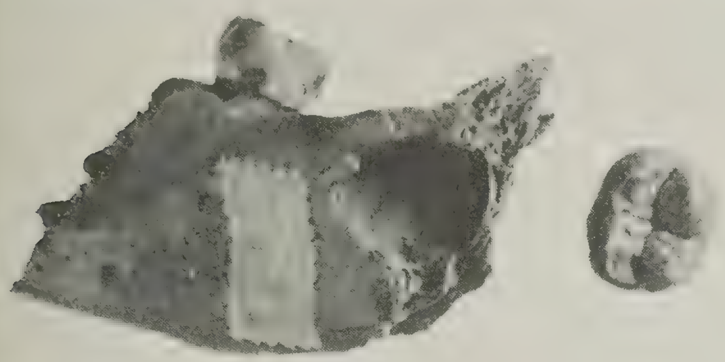

Fig. 24 a. Högra underkäksfragmentet från Mullerup, fotograferat från innersidan. Kronan av den uttagna andra permanenta underkäksmolaren ses vid sidan. Foto 1/1.

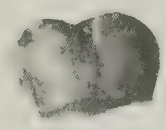

Fig. 24 b. Andra underkäksmolaren, fotograferad från sidan. Foto 1/1.

anförd å sid. 403), och därmed faller också det sista stödet för H. A. Nielsen's åsikt om de såsom primitiva ansedda tandförhållandena hos mullerupkäken.

Sammanfattning.

Slutligen vill jag här sammanfatta de undersökningsresultat, vartill jag anser mig hava kommit angående underkäksfragmenten från Sværdborgs- och Mullerups mossar:

1. I motsats till vad H. A. Nielsen påstår, visa sig de båda käkarna vara försedda med tydliga hakframsprång i full enighet med underkäkar från resp. 14 och 7 års barn.

2. Det går ej att, såsom Nielsen gör, draga en skarp gräns för utbildningen av area genioglossi mellan neolitikens och nutidens underkäkar å ena sidan samt å andra sidan dem, som tillhöra den "paleolitiska" resp. den äldre diluvialtiden. Nutidskäkarnas variationer kunna även framvisa samma typ som den äldre diluvialtidens, om man endast fäster sig vid utbildningen inom area genioglossi. Vidare utvecklas ursprungsfälten för musculus genioglossus liksom hakframsprången allt mera markant under den individuella utvecklingen. Därför torde den lilla gropen å sværdborgkäken, som tillhört ett

14 års barn, ej kunna tillmätas någon större betydelse. Spår efter tvenne spinae genioglossi förekomma även på densamma. I motsats till vad H. A. Nielsen framhållit, saknar mullerupkäken vid noggrant skärskådande fullständigt den grop eller, för att tala med Nielsen, den fossa genioglossi, han särskilt framhäft. Dessutom äro antydningar till eller spåren av spinæ genioglossi mycket tydliga. Enligt Toldt's statistik är allt detta ingenting märkvärdigt.

3. Underkäksfragmentens fastsittande tänder liksom lösa sådana, vilka förvaras å Nationalmuseet i Köpenhamn såsom tillhörande sværdborgfyndet, uppvisa ej heller några anmärkningsvärda förhållanden, när de lösa tänderna fördelas på över- och underkäke i enlighet med deras morfologiska karaktärer. Med stöd av ovenstående tvekar jag därför ej att påstå, att underkäksfragmenten från Mullerups- och Sværdborgs mossar samt de till sværdborgfyndet hörande lösa tänderna icke förete några karaktärer, som kunna berättiga dem till att betecknas såsom primitiva eller "paleolitiska", utan falla alla här konstaterade förhållanden inom gränserna för variationen hos de nutida européerna. Däremot är H. A. Nielsen's uppfattning av dessa skelettresters förhistoriska ålder odisputabelt riktig, då de — såsom även jag genom granskning av Nationalmuseets fyndberättelser kunnat övertyga mig om — blivit funna i orörda kulturlager från maglemosetid och därigenom visat sig vara de äldsta arkeologiskt och geologiskt daterbara resterna av människoben, vi hittills känna från Danmark.

Efterskrift.

Sedan manuskriptet till denna uppsats var färdigt, lyckades författaren å Nationalmuseet i Dr. Friis-Johansen's grävningsberättelse[1]) finna Herluf Winge's uttalande om de rester av män-

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[1]) En tidigare publikation om boplatsen i Sværdborgs mosse finnes av Friis-Johansen i Aarb. f. nord. Old. og Hist. 1919 sid. 106. Även tryckt i den franska upplagan av Aarbøger: Mem. d. Antiq. du Nord 1920–25 p. 241 ff.

niskoben, som H. A. Nielsen sedermera ingående behandlat och publicerat. Då det ju även kan ha sitt intresse att veta, vilka djurben, som funnits tillsammans med ovannämnda fragment, återger jag Winges uttalande in extenso:

Knogler fra Sværdborg Mose.
Sending Juni 1921.

Cygnus olor? Et Skulderblad.

Castor fiber, Bæver. Nedre Ende af et Skinneben, 2 Taaled.

Cervus capreolus, Raadyr, Stykke af Nakkeben, nedre Ende af et Spoleben, nogle Haandrodsknogler, Stykke af Laarben, flere Taaled.

Alces machlis, Elsdyr. En Haandrodsknogle, et Led af en Bitaa.

Sus scrofa. Et Kindben, 2 Haandrodsknogler, Stykke af et Lægben, et Taaled.

Homo sapiens. Adskillige sammenhørende Knogler af et ungt Menneske: Stykker af Over- og Underkæbe[1]) og flere andre Dele af Hovedskallen, en Stump af en Brysthvirvel, Stykker af Ribben. Det meste af begge Overarme og begge Underarme[2]), et Par Mellemhaandsben, et Fingerled, det meste af begge Laarben og begge Skinneben, et Mellemfodsben.

Knoglerne synes ikke at have Mærker af Slag, Snit eller Gnav af nogen Slags.

$^{6}/_{7}$ 1921. Herluf Winge.

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1) Spärr. av förf.

2) Ehuru denna kritik på grund av mina egna speciella käkstudier kommit att blott beröra underkäksfragmenten och de lösa tänderna från Sværdborg, vilka skelettdelar ju få anses såsom Nielsens väsentliga stöd för individets "paleolitiska reminiscenser", har jag dock ej underlåtit att beakta de resultat, vartill han kommit genom en undersökning av de övriga benresterna. Bland dessa är ett vänster strålben (det högra är obrukbart för mätning) den enda skelettdel, hos vilken Nielsen funnit "paleolitiska" resp. neandertaloida kännetecken. Han framhåller, hurusom detta strålben (radius) är "stærkt udad krummet og tillige kort i forhold til humerus" liksom "den palæolithiske radius" (op. cit. p. 211). Sværdborg-individets strålben saknar emellertid epifyser, "er spinkel, 183 mm lang og således", betonar Nielsen, "påfaldende kort". Vad nu kortheten beträffar, så är denna icke särskilt anmärkningsvärd. Jag fann på de tvenne i Lunds Anatomiska Museum utställda skeletten av motsvarande ålder nämligen resp. 14 och 15 års barn från nutiden överarmar och strålben av liknande storlek och proportioner. Deras indices radio-humerales äro resp. 74,9 och 73,6. Nielsens siffra för sværdborgindividet är 74,6. Hans värde befinner sig alltså emellan mina indextal. Enligt

vad Nielsen (op. cit. p. 211) meddelar, uppvisa "danske neolithiske radii" indices växlande "mellem 78,5 og 80,0". Kortheten hos radius är emellertid icke någon primitiv egenskap utan tvärtom, såsom Rud. Martin (op. cit. p. 299) framhåller: "Människan visar den lägsta index radiohumeralis bland alla primater". Bland de olika människoraserna hava europeérna den lägsta indexen, växlande mellan 71,3—76,7. Broca anger för nutidseuropéer ett medelvärde för denna index på 73,93, medan han för negrer ger siffran 79,40. Som vi se härav, befinner sig sværdborgindividets index radio-humeralis (74,6) nära det europeiska medelvärdet, medan däremot de danska neolitikerna ha ovanligt höga indices. De högsta värdena inom Europa i detta hänseende anger Martin för Böhmens neolitiker (♂ 76,5, ♀ 75,7). För nutida tyrolare (♂ 74,5, ♀ 76,5) samt för schwaber och alemanner (♂ 74,3, ♀ 76,7). För homo neandertalensis är denna index 75,0. Jmf. Franz Schwerz, Die Völkerschaften der Schweiz (Stuttgart 1915), p. 96, där han yttrar sig närmare över underarmens proportioner hos neolitikerna. "Niedrigstehende Rassen, wie Neger, Feuerländer, haben einen relativ grösseren Vorderarm, verglichen mit dem Oberarm, als Europäer. Auch in diesem Merkmale stellen die schweizerischen gerade wie die böhmischen und mährischen Neolithiker primitive Verhältnisse dar". Å sid. 188 op. cit. säger han: "Im Radio-humeral-Index unterscheiden sich die Alamannen von den rezenten Europäern. Wie ich unten in der Tabelle zeige, besitzen niedrigstehende Völker einen grösseren Index als hochstehende Typen. Bei ersteren ist also, ähnlich wie bei den Anthropoiden und bei dem menschlichen Kinde, der Unterarm relativ länger als der Oberarm. Auch in diesem Merkmale zeigen also die Alamannen Anklänge an die primitiven Völker". Jag bifogar här Schwerz' tabell, vari även index tibio-femoralis angives. Vi bortse nu från denna, till vilken jag återkommer i samband med Nielsens resonemang därom.

	Radiohumeral-Index		Tibiofemoral-Index	
	♂	♀	♂	♀
Alamannen der Schweiz...	74,7	74,8	80,6	81,7
Europäer................	72,5	72,4	81,1	80,8
Neger..................	79,0	78,3	82,9	84,4
Feuerländer.............	80,6	76,3	83,0	81,5

Av ovanstående torde det utan vidare framgå, att sværdborgindividets radius med hänsyn till sin storlek är att betrakta såsom normal för sin ålder samt att strålbenets korthet icke kan anses som primitiv karaktär utan tvärtom. Det intressantaste i H. A. Nielsens uttalande i fråga om index radio-humeralis gäller icke sværdborgfyndet utan de danska neolitikerna, som ha ovanligt höga indices. Nielsen anför till jämförelse med svärdborgindividets siffra 74,6 den negroida grimaldirasens höga indices, för ynglingen 79,4, för den gamla kvinnan 80,1. Dessa siffror skulle alltså — sällsamt nog — passa bättre ihop med Nielsens indices

för de danska neolitikerna (78,5—80,0). Emellertid anger K. E. Schreiner (Die Menchenknochen der megalithischen Grabkammer bei Svelvik in Norwegen, Kristiania 1923, p. 67) för tvenne norska neolitiska skelett en "index radio humeralis på 80,9 resp. 81,7 med en medelindex alltså på 81,3. Denna siffra överträffar medelvärdena härför hos alla europeiska grupper med 5—10 enheter och befinner sig emellan medelvärdena för eldsländare (80,6) och för invånarne i det mexikanska Kalifornien (81,5)" Vi ha alltså tack vare Schreiner fått en norsk parallell till H. A. Nielsens danska neolitiker med avseende på höga siffror för index radio-humeralis. Vad nu åter bågformen hos strålbenet beträffar (d. v. s. den "radiuskrumning", som Nielsen framhållit såsom ännu en "paleolitisk" karaktär), är denna, mätt enligt mest brukliga metod, ej särskilt anmärkningsvärd. Nielsen har fått en hög bågindex (5,6) genom att mäta krökningen utefter den konkava kanten av sværdborgindividets radius. Mäter man däremot enligt E. Fischers metod längs den konvexa kanten (jmf. Zeitschr. f. Morphol. u. Anthropol. Bd. IX. 1906, p. 167 ff), erhåller man siffran 3 som medelindex. Detta tal befinner sig just mitt emellan de gränsvärden, Fischer funnit för badensarne (1,5—4,5) och helt nära hans medelvärde, som är 3,2 (op. cit. p. 170). Således kan sværdborgindividets "radiuskrumning" ej heller betraktas som "paleolitisk", utan är den tvärtom en av nutidseuropéernas mest typiska. H. A. Nielsen har beträffande sværdborgindividets skenben framhållit, att de äro "lange, kraftige, men slanke knogler" i motsats till "alle palæolithiske tibiæ, der ere korte og robuste". Han borde emellertid även ha pointerat, att den "spinkle radius" från Sværdborg genom sin slankhet skiljer sig från neandertalrasen, vars samtliga extremitetben, radius även inbegripen, utmärkas av en tjockare och mera massiv beskaffenhet. (Jmf. Klaatsch, Praehistorische Zeitschrift, Bd. I, 1909, p. 322.) Den av Klaatsch framhållna massiviteten hos neandertalrasen låter bäst demonstrera sig, om man jämför strålbenet av homo mousteriensis Hauseri, som tillhört en yngling på omkring 15 år med det ungefär jämnåriga sværdborgindividets radius

Vad skenbenen för övrigt beträffar, gör han gällande, att sværdborgindividet på sina tibiae har "normalt stillede øverste ledflader" och "ikke retroverterede ledflader, således som tilfældet er med alle palæolithiske tibiæ." "Den unge Sværdborgmand har gået med strakte knæ, ikke med foroverbøjede som f. ex. Le Moustier- og Spymaendene. Eller for at nævne en bygningsbeslægtet jævnaldrende: ikke som den 18årige unge mand fra Grimaldigrotten eller som Chancelademanden, begge fra tidlig rensdyrtid; de gik begge med foroverbøjede knæ på grund af de retroverterede øverste ledflader på deres tibiæ." Å sid. 213 op. cit. fortsätter Nielsen: "Den unge 18årige fra Grimaldigrotten har, som alt nævnt, retroverterede øverste ledflader paa sine tibiæ." "Den 'negroïde' voxne kvinde. som lå i samme stratum, havde ligeledes retroverterede øverste tibialedflader." Det bör dock framhållas, att "den negroide voxne kvinde" icke blott låg i "samme stratum" som ynglingen utan t. o. m.

i samma grav, den bekanta dubbelgraven i Grotte des Enfants. Här må även påpekas det oriktiga i att hänföra både "den 18årige mand fra Grimaldigrotten" och "Chancelademanden" till "tidlig rensdyrtid". Den förre tillhör förvisso aurignacienperioden (alltså första delen av rentiden), under det att "Chancelademanden" är arkeologiskt tidsbestämd till oomtvistlig magdalénien (således till sista delen av époque du Renne). Vad åter skenbenens "retroverterede øverste ledflader" beträffar, så visa noggranna mätningar, att dylika retroversioner förekomma även hos representanter för nu levande folkslag t. ex. eldsländare och veddas (Fischer i Die Kultur der Gegenwart III: 5 Anthropologie, Leipzig und Berlin 1923, 93 ff.). I trots av att vi hos dylika funnit lika starka retroversioner som hos neandertalarna, hålla likväl dessa nutida raser med ett primitivare förhållande hos skenbenen sina knän fullkomligt sträckta. Man tror därför, att även neandertalarna och representanterna för grimaldirasen ha precis som nutidsmänniskan "gået og stået med strakte knæ, ikke med foroverbøjede". Nielsen framhåller vidare (sid. 212) att „den unge Svaerdborgmand", (vars kroppslängd han uppskattar till 1450 mm) "har med sin femurlængde på 335 mm og sin tibialængde på 280 mm index tibiofemoralis på 83,8"; "og slutter sig" sværdborgindividet härigenom "til Cro-Magnonrasen". "Dog vise de lange tibiæ" (op. cit. p. 214) och den "høje index tibio-femoralis ogsaa hen mod Danmarks nystenalders befolkning", som enligt Nielsen har en index på 83,0, medan Martin (op. cit. p. 316) för cromagnonrasen anger en index på 81,3. Man kan ej undgå att lägga märka till den relativt höga siffra, som Nielsen anger för de danska neolitikerna (83,0) samt isynnerhet för sværdborgindividet (83,8). Här visar sig åter märkvärdigt nog vid jämförelse med grimaldirasen en viss överensstämmelse. Nielsen anger för ynglingen en index på 83,7, för den gamla kvinnan 83,8. Werth [op. cit. p. 265] ger för samma individer något högre värden: resp. 83,77 och 83,87. För homo neandertalensis anger Martin (op. cit. p. 328) denna index till 78,6. I Schreiners arbete (op. cit. p. 67) ser man emellertid, att bland nutida och neolitiska européer lika höga indices tibio-femorales som hos sværdborgindividet och de danska neolitikarna erhållits, ja, i ett fall t. o. m. betydligt högre: "Franzosen (n. Soularue) ♂ *84,5*, ♀ *82,8* Alte Pariser ♂ *83,8*, ♀ *82,5*. Neolithiker Böhmens ♂ *83,4*, ♀ *83,3*". Jmf. sid. 410 i denna uppsats, där Schwerz' tabell finnes införd

Man torde slutligen med all rätt betvivla, att av 162 individer från Danmark stenålder 94 eller 58 % skulle tillhöra cromagnontyp (Nielsen op. cit. p. 214). C. M. Fürst har redan 1910 opponeret mot Nielsens sätt att införa typiskt nordiska kranier (med långa smala ansikten) under begreppet cromagnontyp (Fürst, Zur Kraniologie der schwed. Steinzeit [K. sv. Vet. Akad:s Handl. Bd. 49, 1912: I, sid. 59]). Nyligen har Kraitschek i anslutning till Fürst kritiserat Nielsen härför (G. Kraitschek, Die Nordische Rasse, Mitt. anthrop. Ges. Wien III, Bd. 1923 p. 193 ff.). Emot den nordiska rasens härstamning från cromagnontypen ha bl. a. Boule (op. cit. 1923, p. 352) och Werth (op. cit. p. 332)

Resumé.

Unterkieferfragmente und lose Zähne von Menschen aus der Maglemoseperiode Dänemarks.

Seit Oktober 1923 ist der Verfasser dieses Aufsatzes im anthropologischen Laboratorium des anatomischen Instituts an der Universität Lund mit einer Untersuchung dort befindlicher prähistorischer und rezenter Unterkiefer beschäftigt. Darum ist es natürlich, dass die letzten bemerkenswerten Unterkieferfunde aus den dänischen Mooren von Maglemose bei Mullerup und von Sværdborg (beide auf der Insel Seeland), die in Aarbøger for Nordisk Oldkyndighed og Historie 1921 von Prof. Dr. H. A. Nielsen veröffentlicht worden sind[1]), meine Aufmerksamkeit erregt und den Anlass zu vielen Reflexionen und Vergleichen gegeben haben. Ferner hatte Prof. Dr. C. M. Fürst, der die Gelegenheit gehabt hat, die fraglichen Unterkiefer im Nationalmuseum zu Kopenhagen zu sehen, mir gegenüber geäussert, dass diese Unterkiefer kritischer bearbeitet und abgebildet werden müssten, ehe man daraus anthropologische und archäologische Schlüsse ziehen könne. Deshalb habe ich mich Weihnachten 1923 entschlossen, an Ort und Stelle eine solche Untersuchung vorzunehmen. Durch die Liebenswürdigkeit des Vorstandes der prähistorischen Abteilung beim Nationalmuseum, Inspektor C. Neergaard, und durch den gefälligen Beistand des Staatsgeologen Dr. phil. V. Nordmann und mit Hilfe des Photographen des Nationalmuseums, Herrn Sophus Bengtsson, gelang es mir, verschiedene Photographien aufzunehmen, die einen besseren Begriff von den schon durch ihr hohes Alter bemerkenswerten Unterkieferfunden geben können. Auch bekam ich die Erlaubnis,

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samt nu senast K. Saller (Resumptio genetica, Del I, Afl. 3, 1925, p. 2) uttalat sig. Hur som helst härmed, ett noggrannare studium av extremitetresterna från Sværdborg torde i alla fall ge vid handen, att vi även här endast ha att göra med karaktärer, som helt falla inom de nutida européernas variationsbredd.

[1]) S. 205 ff. Auch in der französischen Ausgabe der Aarbøger erschienen unter dem Titel: "Squelettes humains du plus ancien âge de la pierre découverts dans les tourbières de Sværdborg et de Mullerup." (Memoires de la Société royale des Antiquaires du Nord 1920—25 p. 33 ff.).

[2]) Aarb. f. nord. Oldk. og Hist. 1906, 1911 und 1915.

die Unterkieferfragmente eingehend zu messen und zu studieren und sie mit dem reichen anthropologischen Material, das im Nationalmuseum zu Kopenhagen vorhanden und durch die bedeutungsvollen Zusammenstellungen und Beschreibungen von Prof. Dr. H. A. Nielsen der Wissenschaft zugute gekommen ist[2]), zu vergleichen. Meine vorerwähnten Untersuchungen sind durch wiederholte Studienbesuche in Kopenhagen sowohl im Nationalmuseum wie im Zoologischen Museum und im Normalanatomischen Institut ergänzt worden. Ich kam dadurch zu der Überzeugung, dass die anthropologische Sonderstellung, die H. A. Nielsen den beiden Unterkiefern gegeben hat, schwerlich richtig sein könne. Ursprünglich war es meine Absicht, diese Ergebnisse meiner Untersuchungen nur im Verein mit einer grösseren Abhandlung über die Anthropologie des Unterkiefers zu veröffentlichen, aber das Interesse, womit H. A. Nielsens Aufsatz in naturwissenschaftlichen und besonders in archäologischen Kreisen (Literaturhinweis S. 366 im schwed. Text, Fussnote [3])) behandelt worden ist, und die Schlüsse auf die älteste Bevölkerung des Nordens, die man in diesen Kreisen daraus gezogen hat, haben mich veranlasst, den Wünschen nach einer früheren, separaten Veröffentlichung entgegenzukommen. Das Wohlwollen, das der Direktor des Zoologischen Museums Prof. Dr. Ad. S. Jensen mir erwies, hat bewirkt, dass ich auf seinen Wunsch meine ersten Mitteilungen in dieser Zeitschrift mache.

Eingangs muss betont werden, dass H. A. Nielsen in seinem obengenannten Aufsatze die Paläolithzeit in Gegensatz zur Rentierzeit stellt, was den Leser in hohem Grade irreführen kann, da nach der gebräuchlichen archäologischen Terminologie die Rentierzeit den späteren oder den letzten Teil der Paläolithzeit bildet. So zum Beispiel teilt M. Boule in seinem bekannten Werke "Les Hommes Fossiles"[1]) das Paläolithikum (paléolitique) folgendermassen ein: I. die Periode des Flusspferdes (époque de l'Hippopotame), II. die Periode des Mammuts (époque du Mammouth) und schliesslich III. die Periode des Rentieres (époque du Renne). Wenn man, wie H. A. Nielsen es tut, die Rentierzeit mit der Zeit der Cro-Magnonrasse gleichstellt, so muss man mit den Menschen der Paläolithzeit die Neandertalrasse meinen. Jedenfalls ist der Ausdruck "paläolithischer Unterkiefer" durch "neandertaloider Unter-

[1]) 2e éd., Paris, 1923, p. 49.

kiefer“ oder richtiger durch “Unterkiefer eines Neandertalmenschen (Homo primigenius)“ zu ersetzen, was in diesem Falle stimmen würde, da er meint, dass den Unterkiefern die Kinnprominenz fehle. Er sagt nämlich in seinem obengenannten Aufsatze von dem Sværdborgunterkiefer, dass er “eine Reihe paläolithischer Erscheinungen“ aufweise: I. “fehlende Kinnprominenz“, II. “fehlende crista genioglossi“ und III. “fünf Höcker auf allen drei permanenten Molaren des Unterkiefers, von denen der letzte in jedem Fall grösser als der zweite und länger als der erste ist.“ Meine Aufgabe ist hier also, jede von diesen behaupteten Eigenschaften des Unterkiefers kritisch zu bewerten.

I.

Was die Kinnprominenz betrifft, ist eine solche, wie aus dem Bilde bei Nielsen (S. 206) hervorgeht, doch schon vorhanden. Prof. Dr. Fürst und Dr. phil. V. Nordmann hatten mich darauf aufmerksam gemacht, dass das photographische Bild einen irreführenden Eindruck gibt. Das eigentliche (sagittale) Kinnprofil liegt nämlich, wenn man es auf dem Bilde näher studiert, vor der äusseren Konturlinie. Ein korrektes photographisches Bild, wie es dem Verfasser im Nationalmuseum zu Kopenhagen aufzunehmen gelang, zeigt eine weit deutlichere und markantere Kinnprominenz (Fig. 1). Es kommt hinzu, dass Nielsen als Vergleichsobjekt einen Unterkiefer mit der Bezeichnung “Unterkiefer aus der neueren Zeit“ gewählt hat, der als zu grosser Kontrast wirkt und wenig angebracht ist. Andere Abbildungen gibt es in dem Aufsatze nicht. Nielsen meint, dass der Sværdborgkiefer einem 16- bis 18-jährigen Jüngling angehöre.

In seinem obengenannten Aufsatz hat er auch einen Fund von zwei Unterkieferfragmenten aus Maglemose bei Mullerup besprochen. Diese Fragmente sind von Herluf Winge in Sarauws Bericht erwähnt[1]). Sarauw und Winge aber haben sich damit begnügt, den Fund des Unterkiefers eines Kindes anzuzeigen. Nielsen meint, dieser Unterkiefer rühre von einem 7- bis 8-jährigen Kinde her. Er sagt von diesem Unterkiefer (S. 216), I. es fehle ihm die Kinnprominenz in ebenso “hohem Grade, wie dem Sværdborgkiefer,

[1]) Praehistorische Zeitschrift, Bd. III, 1911, S. 101.

indem die Kontur hier steiler verläuft", II. es fehle ihm auch die "crista oder spina mentalis superior des Neolithikums, die hier wie auch bei dem Særdborgunterkiefer durch eine Grube wie bei den paläolitischen Kiefern ersetzt" sei.

Es ist zu bemerken, dass H. A. Nielsen die Kinnprominenz bei einem 7- bis 8-jährigen Kinde (dem Mullerupkiefer) mit derjenigen des Sværdborgkiefers vergleicht, der nach ihm einem 16- bis 18 jährigen Jüngling angehört, und dass er als typisches rezentes Vergleichsmaterial einen Unterkiefer von dem extremen Typus abbildet, der bei Greisen mit beginnender Alveolaratrophie vorkommt. Jeder, der sich mit den Unterkiefern verschiedener Altersklassen beschäftigt hat, sieht ein, dass die Kinnprominenz eine Eigenschaft ist, die sich während der individuellen Entwickelung des Menschen erst allmählich ausbildet. Im anatomischen Museum an der Universität Lund habe ich die Möglichkeit gehabt, eine ziemlich grosse Anzahl von Kinderunterkiefern aus der prähistorischen Zeit, dem frühen Mittelalter und der Gegenwart zu untersuchen. Dabei konnte ich feststellen, dass eine grosse Anzahl Unterkiefer von Kindern in einem Alter von 7 bis 8 Jahren eine ebenso geringe Ausbildung der Kinnprominenz wie der Unterkiefer von Maglemose bei Mullerup aufweist. In einigen Fällen habe ich sogar eine geringere Ausbildung der Kinnprominenz gesehen. Wenn man also den Mullerupkiefer mit den Unterkiefern desselben Alters vergleicht, ist er mit Rücksicht auf die Kinnprominenz als normal zu betrachten (siehe Fig. 4). Was den Sværdborgunterkiefer betrifft, so findet man auch unter Kiefern der Erwachsenen solche mit weit geringerer Kinnprominenz. Meine Erfahrung stützt sich hier wie sonst hauptsächlich auf schwedisches Skelettmaterial. Inzwischen ist aber von Louis Bolk eine interessante Abhandlung erschienen.[1]) In dieser beschäftigt er sich mit Verhältnissen, die grössere Klarheit über die Formen der von H. A. Nielsen beschriebenen Unterkiefer liefern. Der interes-

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[1]) L. Bolk. Die Entstehung des Menschenkinnes. Verhandelingen der Koninklijke Akademie van Wetenschappen te Amsterdam (Tweede Sectie, Deel 23, No. 5, Amsterdam 1924. Bolk hat von der gleichen Akademie eine vorläufige Mitteilung auf englisch herausgeben lassen (Proceedings Vol. XXVII N: os 3 und 4, 1924, S. 329—344 betitelt: The chin problem.)

sierte Leser wird auf Bolks Abhandlung verwiesen, besonders auf die Seiten 30 bis 38 mit spezieller Rücksicht auf die Figuren 8 und 9. Er sagt auf Seite 30, dass kindliche Kiefer aus dem fünften und sechsten Lebensjahre "als hauptsächlichstes Merkmal kein vorspringendes Kinn haben". (Siehe weiter S. 369 und 370 dieses Aufsatzes). Auf Seite 32 sagt er: "Kiefer von Kindern aus dem 7. und 8. Lebensjahre zeigen eine grosse Ähnlichkeit mit diluvialen Kiefern, bei denen ein wirkliches positives Kinn fehlt." Bolk muss mit dem Ausdruck "diluvial" "altdiluvial" meinen, denn bei den jungdiluvialen (= jungpaläotischen) Rassen, besonders bei der typischen Cro-Magnonrasse, kommt ein prominentes, dreieckiges Kinn immer vor. Ich will in dieser Sache nur auf die Arbeit Werths hinweisen.[1] Deshalb kommt man zu einem Missverständnis, wenn man mit Bolk sagt, dass ein vorspringendes Kinn "ein Erwerb postdiluvialer Menschenrassen" sei. Wenn man seine Abhandlung besonders auf den Seiten 102—103 studiert, kommt man zur Einsicht, dass er mit diluvialen Unterkiefern den Unterkiefer der Neandertalrasse (Homo primigenius) meint. "Der Unterkiefer des Homo primigenius behält", sagt er, (S. 103) "seine infantile Gestalt". Es scheint mir, als ob Bolk unter "diluvialen Unterkiefern" dasselbe, wie H. A. Nielsen unter "paläolithischen Unterkiefern" versteht. Wenn wir zu den dänischen Unterkiefern zurückkehren und die Figuren 2 und 3 studieren, sehen wir, dass sowohl der Unterkiefer aus Maglemose (Fig. 2), wie derjenige aus Sværdborg (Fig. 3), beide en face photographiert, gut ausgeprägte Kinnprotuberanzen (protuberantiae mentales) haben. Ich werde im Abschnitt III zeigen, dass der Unterkiefer von Sværdborg eher einem 14-jährigen als einem 16- bis 18-jährigen Individuum angehört (siehe S. 420 in diesem Resumé). Obgleich es unrichtig ist, den Unterkiefer von Maglemose, der von einem 7- bis 8-jährigen Kinde herrührt, und denjenigen eines 14-jährigen Kindes (Kiefer aus Sværdborg) mit den Kiefern der Erwachsenen zu vergleichen, geben doch Messungen eine bessere Grundlage für einen Vergleich. Der Symphyswinkel bei dem Maglemosekiefer betrug circa 70°; derjenige des Sværdborgkiefers 66°. Wenn die Kinder, denen diese

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[1]) E. Werth. Der fossile Mensch (Berlin 1921 ff.), S. 286—290; siehe auch S. 372 ff. in diesem Aufsatze.

Kiefer einmal gehörten, länger gelebt hätten und zu reifem Alter gekommen wären, hätten sie sicherlich kleinere Symphyswinkel wie auch grössere Kinnprominenzen bekommen (vergl. Bolk). So wie sie jetzt sind, fallen sie ganz und gar in die Variationsbreite typischer Unterkiefer von rezenten erwachsenen Europäern (vgl. damit die im schwedischen Texte zitierte Statistik aus Frizzi und Rud. Martin, S. 376 und 377, dieses Aufsatzes).

II.

Hiermit gehen wir zu Punkt II. über, der das Fehlen der Crista genioglossi beim Sværdborg- wie beim Mullerupunterkiefer behandelt. Auf S. 207 sagt H. A. Nielsen: "Aber ausserdem" (Nielsen zielt hierbei auf das behauptete Fehlen der Kinnprominenz ab, das im Abschnitt I. behandelt wurde), "hat der Sværdborgunterkiefer noch ein paläolithisches Kennzeichen in der Kinnregion. Auf der Hinterfläche der Kinnpartie besitzen alle neolithischen und rezenten Menschen einen vorspringenden Kamm (eine Leiste), eine Spina mentalis superior oder Crista genioglossi als Ursprungsstelle für den Musculus genioglossus. Der paläolithische Unterkiefer hat dagegen anstatt einer Crista eine flache Grube im Knochen mit einem rauhen, spitzigen Höckerchen als Ursprungsstelle für den M. genioglossus. Der Sværdborgunterkiefer hat hier auch gleichwie der paläolithische Unterkiefer eine Fossa genioglossi anstatt einer Crista. Diese eigentümliche Tatsache scheint mir nur in geringem Grade beobachtet worden zu sein, obgleich sie seit langem erwähnt und bekannt ist" ... Hierüber äussert er sich des weiteren in einer Fussnote S. 216: "Es scheint ein durchgehender Zug zu sein, dass die Spina mentalis superior oder die Crista genioglossi, die sich bei Neolithikern und rezenten Menschen auf der Hinterfläche der Kinnpartie findet, bei den paläolithischen Unterkiefern durch eine Grube ersetzt ist. Mortillet, Fraipont und Boule geben in ihren Arbeiten an, dass dies bei den Unterkiefern von Heidelberg, La Naulette, Spy I und Spy II, La Ferassie, La Chapelle aux Saints, Malarnaude und Ehringsdorf der Fall ist."

Es ist indessen nicht zulässig, wie Nielsen es tut, zwischen der Ausbildung der Area genioglossi der Unterkiefer des Neolithikums und der Gegenwart einerseits und der des Paläolithikums resp. der älteren Diluvialzeit andererseits eine scharfe Grenze zu ziehen.

Die Variationen der rezenten Unterkiefer können auch die gleichen Typen aufweisen wie die der älteren Diluvialzeit, wenn man nur auf die Ausbildung innerhalb der Area genioglossi Rücksicht nimmt (vgl. G. Sergi, La mandibola umana, Rivista di Anthropologia, vol. XIX, 1914, besonders die Figuren auf S. 123—127; siehe auch S. 387 ff. dieser Abhandlung). Ferner bilden sich die Ursprungsstellen für den paarigen Musculus genioglossus gleichwie die Kinnprominenzen während der individuellen Entwicklung mehr und mehr markant aus (siehe Toldt, Über den vorderen Abschnitt des menschlichen Unterkiefers mit Rücksicht auf dessen anthropologische Bedeutung; eingehend besprochen und zitiert S. 378—381 dieser Abhandlung).

Deshalb dürfte der kleinen Grube am Sværdborgkiefer, der von einem 14-jährigen Kinde herrührt, keine grössere Bedeutung zugeschrieben werden können (siehe Fig. 6). Eine Untersuchung dieses Kiefers hat auch gezeigt, wie schon Prof. Dr. Fürst bei seinem Besuch in Kopenhagen feststellen konnte, dass deutliche Spuren zweier Spinae für den Musculus genioglossus vorhanden sind. Im Gegensatz zu dem, was H. A. Nielsen hervorgehoben hat, fehlt dem Mullerupkiefer bei genauem Betrachten diese Grube vollständig oder, um mit Nielsen zu sprechen, die Fossa genioglossi, die er besonders hervorhebt (siehe Fig. 5). Auch waren die Spuren der Spinae genioglossi sehr deutlich. Nach der Statistik von Toldt ist dies nichts Bemerkenswertes (siehe S. 379 und 380 dieser Abhandlung).

III.

Die im Unterkieferfragment festsitzenden Zähne wie auch die losen, die im Nationalmuseum in Kopenhagen als zum Sværdborgfund gehörig aufbewahrt werden, weisen ebenfalls keinerlei bemerkenswerte Verhältnisse auf, wenn die losen Zähne in Übereinstimmung mit ihren morphologischen Merkmalen auf den Ober- und Unterkiefer verteilt werden. Nielsen hat jedoch in den Unterkiefer als Molar II. und III. der rechten Seite 2 typische Oberkiefer-Molaren einreihen wollen (siehe Fig. 12a und b). Ich habe diese Zähne als resp. linken und rechten zweiten oberen Molar bestimmt (M_2 sup. sin. et dx.). Nur durch diesen Irrtum konnte Nielsen zur Auffassung gelangen, dass der letzte Molar grösser sei als der zweite und länger als der erste (vgl. S. 415 dieses Resumés).

Auf diesen typisch vierhöckerigen oberen Molaren zählte er fünf Höcker. Durch diese beiden Irrtümer bekam er auf der rechten Seite des Unterkiefers drei fünfhöckerige Molaren, was er wieder als ein paläolithisches Kennzeichen verwertet. Die von Röse und Mühlreiter mitgeteilte Statistik zeigt, dass, selbst wenn alle Molaren des Unterkiefers 5-höckerig sind, dies sehr gut bei rezenten Individuen vorkommen kann, was auch ich im Anatomischen Museum zu Lund gesehen habe (siehe S. 402 und 403 dieser Abhandlung). Auch beim linken Sværdborgkieferfragment hat er geglaubt, am zweiten unteren Molar 5 Höcker zu sehen, trotzdem dieser, wie Fig. 8 zeigt, nur 4 besitzt. Das gleiche gilt für das rechte Unterkieferfragment von Mullerup (siehe Fig. 24 a). Die beiden oberen zweiten Molaren bei dem Sværdborgkinde haben nicht vollständig entwickelte Wurzeln. Die totale Zahnlänge beträgt für diese Zähne 16 mm (siehe Fig. 13 a und b). Der zweite linke untere Molar hat dieselbe Länge, und die Wurzeln waren in demselben Entwicklungsstadium. Die beiden ersten unteren Molaren waren abgenutzt (siehe die Fig. 8 und 9). Der zweite linke untere Molar war nicht bis auf das Niveau der Kaufläche entwickelt. Der zweite linke untere Prämolar war ebenfalls nicht voll entwickelt; nicht einmal der erste linke untere Prämolar war ganz zur Kaufläche hervorgetreten (siehe Fig. 8). Das Entwicklungsstadium der Zähne deutet darauf hin, dass der Svärdborgkiefer nicht von einem 16- bis 18-jährigen Jüngling, sondern von einem 14-jährigen Kinde herrührt, eine Schätzung, die die anderen Skelettreste von Sværdborg bestätigen.

* * *

Gestützt auf Obiges wage ich zu behaupten, dass die Unterkieferfragmente aus den Mooren von Mullerup und Sværdborg sowie die zum Sværdborgfund gehörigen losen Zähne keinerlei Merkmale aufweisen, die dazu berechtigen, sie als primitiv oder “paläolithisch“ zu bezeichnen, sondern alle hier festgestellten Verhältnisse liegen innerhalb der Grenzen für die Variation bei den rezenten Europäern. Dagegen ist die Auffassung von H. A. Nielsen über das vorgeschichtliche Alter dieser Skelettreste ohne Zweifel richtig, da sie — wie auch ich mich durch Prüfen der Fundberichte des Nationalmuseums überzeugen konnte

— in unberührten Kulturlagern der Maglemosezeit gefunden sind und sich dadurch als die ältesten archäologisch und geologisch datierbaren Reste von Menschenknochen erwiesen haben, die wir bisher von Dänemark kennen.

Nachtrag.

Leider fand ich erst nach Abschluss meines Manuskriptes Winges Archivbericht über den hier besprochenen Sværdborgfund. Ich lasse ihn auf Seite 409 im Wortlaute folgen. In Fussnote 2 (ibid.) äussere ich mich auch über die anderen menschlichen Knochenreste des Fundes, die Nielsen behandelt hat. Es blieben danach von denjenigen Erscheinungen, die er als "paläolithische" Merkmale betrachtet, nur die Kürze und die starke Krümmung der Speiche übrig. Nach seiner Angabe beträgt der Radiohumeralindex des Sværdborgindividuums 74,6. Diese Ziffer dürfte jedoch schwerlich als "paläolithisches" Kennzeichen in Betracht kommen; denn gerade bei rezenten Europäern finden wir die verhältnismässig sehr niedrigen Indexziffern 71,3—76,5 (s. Rudolf Martin, a. a. O. p. 299; vgl. auch die auf Seite 410 meines Aufsatzes ausführlich zitierten und besprochenen Angaben von Franz Schwerz). Der Index des Homo Neandertalensis beträgt nach Martin 75,0 und befindet sich also über dem Durschschnittswerte des Indexes rezenter Europäer. Auch weist unter den Primaten überhaupt der Mensch den niedrigsten Index auf (s. Rudolf Martin a. a. O. p. 299). Ich vermag mich deshalb auch in diesem Punkte nicht der Ansicht H. A. Nielsens anzuschliessen. Um so beachtenswerter erscheinen mir die hohen Radiohumeralindizes der dänischen Neolithiker. Nach Nielsens Messungen bewegen sie sich zwischen 78,5 und 80,0. Jedoch betragen nach Schreiner[1]) die Radiohumeralindizes zweier neolithischer Skelette aus Norwegen 80,9 und 81,3. Sie übertreffen damit auch die Ziffern der Nielsenschen Messungen.

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[1]) K. E. Schreiner, Die Menschenknochen der megalithischen Grabkammer bei Selvik in Norwegen, Kristiania 1923, p. 67.

Den Wert für die erwähnte Speichenkrümmung hat Nielsen durch Messung längs der konkaven Kante erhalten. Schliesst man sich der Methode Fischers[1]) an und misst also längs der konvexen Kante, so ergibt sich als entsprechender Wert ca. 3. Diese Ziffer liegt innerhalb der von Fischer angegebenen Variationsbreite für die Indizes von Badenern und zwar ganz in der Nähe ihres Mittelwertes 3,2.[2]) Erwähnt sei weiterhin die schlanke Form der Sværdborgspeiche, die in auffallendem Gegensatze zu der Speiche des etwa gleichaltrigen Jünglings von Moustier steht.[3]) Es ergibt sich somit, dass auch die Speiche des Sværdborgfundes keine neandertaloiden oder "paläolithischen" Kennzeichen aufweist. Damit schwindet der letzte Anlass, die Knochenreste des Sværdborgfundes als "paläolithisch" anzusprechen.

2—11—1925.

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1) E. Fischer, Zeitschrift für Morphologie und Anthropologie, Bd. IX. 1906, p. 167 ff.

2) E. Fischer, a. a. O., p. 170.

3) Vgl. Klaatsch, Praehistorische Zeitschrift, Bd. I, 1909, p. 322; s. auch Boule, Annales de Paléontologie 1912, p. 130 und E. Fischer a. a. O., p. 163 f.

Danaella mimonectes (n. gen., n. sp.),
a new bathypelagic Gammarid (Fam. Lysianassidæ) from South Greenland waters.

By
K. Stephensen.

During the fishery investigations carried out by the "Dana" by Prof. Ad. S. Jensen in Greenland waters in the spring and summer of 1925 a specimen of a very remarkable new Amphipod was secured.

The locality was: "Dana" St. 2401: 61° 47' N, 52° 55' W, 3000 m, 1900 m wire, 9—7—1925, 2^{40} pm. At the same locality the following pelagic species of the fam. Lysianassidæ were secured:

Cyphocaris anonyx Boeck, abt. 15 spec,, including some ♀ ovig. (on the species see my paper on the "Ingolf"-Amphipoda pt. 1 [Danish "Ingolf" Exped. vol. III, 8, 1923, p. 50]).
Metacyphocaris Helgæ Tattersall, 5 spec. (see ibid. p. 54).
Koroga megalops Holmes, 1 spec. (see ibid. p. 60), and
Katius obesus Chevreux, 4 spec. (see ibid. pt. 2, "Ingolf", vol. III, 9, 1925, p. 126).

Later on I have found a second specimen in the material collected by the "Dana".

Genus *Danaella* n. gen.

The body is globular, but the globe essentially consists of the highly inflated third to sixth mesosome segments. The head and the first and second mesosome segments are small, and the seventh segment is somewhat compressed and narrow, in dorsal view not much broader than the compressed metasome segments. The urosome possibly consists of only two segments; but if my interpretation is correct,

there is an extremely short third segment with rudiments of the small, bud-like third pair of uropods. First and second pairs of uropods are well developed, but the inner rami in both pairs small and spiniform. There is no trace of telson. The side plates of third to sixth pairs of pereiopods, especially those of the fourth pair, are very large and contribute to the forming of the globe.

Through its globular shape this new forms recalls the Hyperid *Mimonectes* (see Bovallius: Mimonectes, a remarkable genus of

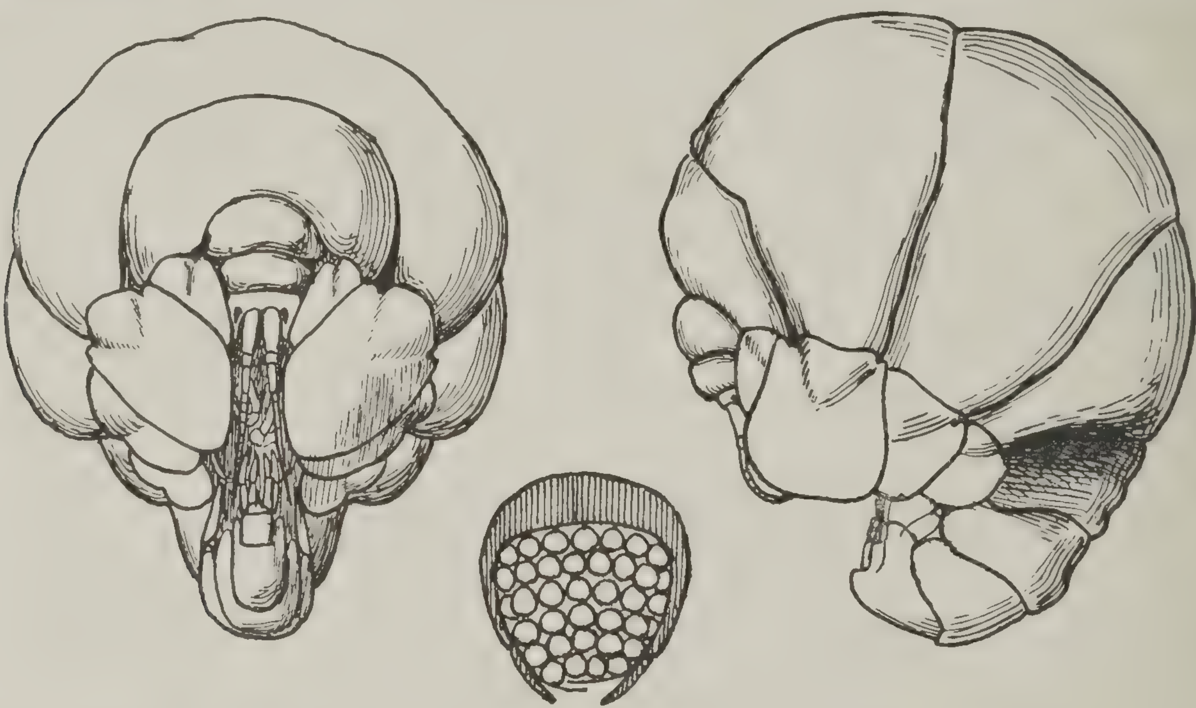

Fig. 1. *Danaella mimonect,* seen from below and from the left side. In the centre a diagrammatic transversal section through the fourth mesosome segment showing the eggs in the marsupium.

Amphipoda Hyperiidea [Nova Acta Reg. Soc. Sci. Upsal., ser. III, vol. 13, 1885, p. 2], and Bovallius: Contributions to a Monograph of the Amphipoda Hyperiidea, part 1:2, 1889, p. 59 [Kgl. Svenska Vet. Akad. Handl., Bd. 22, No. 7, 1889]). But in *Mimonectes* the globe is shaped partly of quite other segments, the enormous head and the two first segments making the half of the globe, while in *Danaella* the head and these two segments are of no importance in the forming of the globe. Here-to comes that in *Mimonectes* the ventral side of the mesosome is the ventral side of the globe; but this is not the case in *Danaella,* for here the globe is hollow, the ventral side of the mesosome lying far dorsally of the centre of the globe (see fig. 1: the schematic transversal section). There are several other differences, for example: the side plates small in Mimonectes, large (at all events some of

them) in *Danaella*, — and the urosome well developed in *Mimonectes*, reduced in the other genus.

The antennæ are well developed, but ant. 1 without accessory flagellum. The oral parts are rather reduced. The epistomal plate very little prominent; it was impossible to give any drawing of the posterior lip. The mandibles are simple, without any special structure

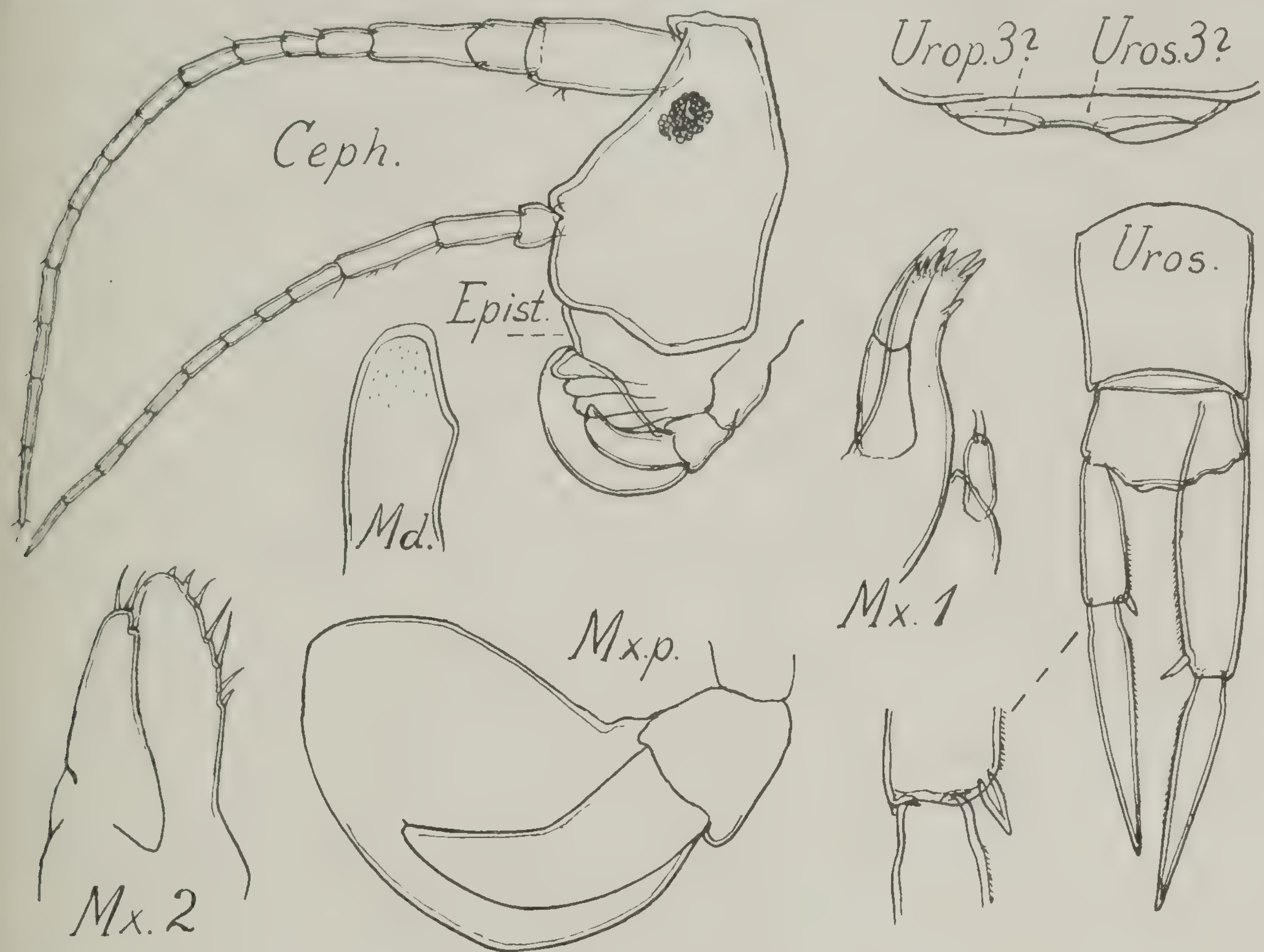

Fig. 2. The head, oral parts and urosome. The fig. in the right corner above shows the end of the urosome with the third urosome segment (?) and the third pair of uropoda (?).

and without palp, but the two pairs of maxillæ rather normal. The maxillipedes consist of two basal joints, a pair of large, helmet-shaped ovate plates (probably the outer lobi), covering the other oral parts, and a pair of curvate, acute plates (the inner lobi), lying inside the large plates. Thus the oral parts bear a close resemblance to those in *Mimonectes* The helmet-shaped maxillipedes are also found in the two strange pelagic (or semi-parisitic) Lysianassidæ *Thoriella islandica* K. St. and *Chevreuxiella metopoides* K. St. (see K. Stephensen: Isopoda — — Amphipoda; Report on the Danish Oceanographical Expeditions 1908—10 to the Mediterranean and adjacent Seas, vol. II, D. 1, 1915, pp. 39—43, figs. 23—25), but in *Chevreuxiella* they are not so highly reduced.

The first two pairs of pereiopoda are simple, with very short dactyli.

The generic name *Danaella* was made in honour of the ship "Dana" which has taken the specimens.

Danaella mimonectes n. sp.

Occurrence. "Dana" St. 2401. 61°47' N, 52°55' W, 3000 m, 1900 m wire. 9—7—1925, 2^{40} pm. 1 ♀ ovig. (the globe abt. 9 mm in diametre) (the type). — "Dana" St. 2308. 59°21' N, 37°56' W, 3000 m wire. 1—6—1925, 9^{00} pm. 1 ♀ ovig. (the globe abt. 11 mm in diametre).

Description of ♀ ovig. from St. 2401 (♂ is unknown). The skin is thick, tough, coriaceous.

The head very little, in lateral view almost triangular (with the acute end turned above) and partly concealed under the side plates. There is a very little rostrum. The eyes small, ovate, black. Antenna 1 a little longer than ant. 2, almost as long as the fourth side plate is deep. The first peduncular joint as long as the two next joints combined and not much heavier. 12 flagellar joints. In the peduncle of ant. 2 the two distal joints are of equal size. The flagellum has in the left ant. 8 joints, in the right one more, for the two first joints in the right ant. are in the left coalesced to one. On the oral parts see above.

The first pereiopod has the side plate very little; the second joint broad, ovate. The metacarpus ovate, somewhat shorter than the preceding joint; the dactylus very little, triangular. The second pereiopod has the side plate somewhat curvate and longer than the first pair; the limb is long, narrow, with the metacarpus only half as long as the carpus. The dactylus is very short. The 5 last pairs of pereiopoda have about the same shape (except the side plates; see below); they are short, with the long curvate dactyli about as long as the metacarpus. The second joint is broader in the 5.—7. pairs than in the 3.—4. pairs. In the 3.—5. pairs (but not in the two last pairs) the metacarpi have two little spines at the distal end. The third side plate is curved triangular, much larger than the second; the fore margin seems to fit totally the hind edge of the second joint of the second pereiopod. The fourth side plate is almost quadratic with rounded corners; it is much larger than the

other plates and covers the hind edge of the third and the fore edge of the fifth side plate; it is so large, that the limb is only an appendix on the inner side. The fifth and the sixth plates have

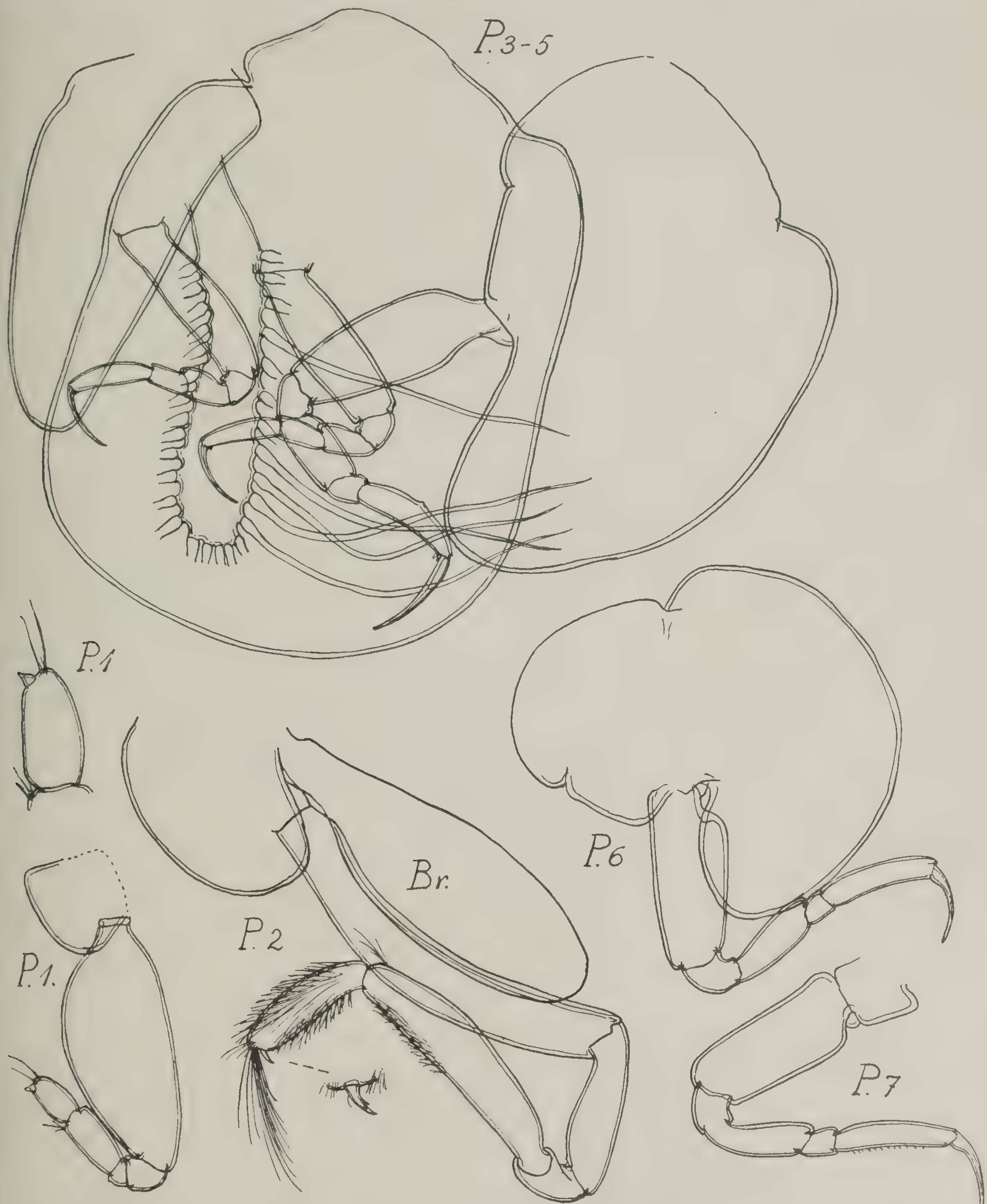

Fig. 3 The pereiopoda. Br.: branchiæ.

almost the same shape, the hind edges strongly curvate; the seventh side plate is almost quadrate, very little, and totally hidden under the sixth.

The branchiæ are narrow, sacciform (see the fig. of p. 2, fig. 3); the marsupial plates very narrow with very long marginal setæ (see

fig. of p. 4, fig. 3). The marsupium contains numerous eggs, at all events 200—300; the diametre of the eggs is 0.8 mm.

The pleopoda are well developed, with abt. 14 joints in the long rami. The inferior hind corners of the metasome segments are rounded, and the length of the metasome is abt. $^1/_3$ of the diametre of the globe.

The urosome is very short, possibly with only two segments (see above, under the genus), with first segment twice as long as the second. The two pairs of uropoda are long, narrow; the inner rami are very short, spiniform, the outer rami acute. The first pair is somewhat longer than the second pair, with the outer ramus a little shorter than the peduncle; in the second pair the outer ramus is abt. $1^1/_2$ time as long as the peduncle.

Size. The diametre of the globe is abt. 9—11 mm.

Colour. The specimen was (in spirits) quite colourless, but the eyes have kept their black colour.

Remarks. The specific name indicates the great resemblance to *Mimonectes.*

The species has a very remarkable position within the family; in spite of the globular shape it is especially on account of the quite degenerated mandibles without palp, the helmet-shaped maxillipedes and the reduced urosome most nearly allied to *Chevreuxiella* and *Thoriella.*

10—11—1925.

Planaria alpina (Dana) als Glazialrelikt in Südschweden und auf Bornholm.

Von

O. Lundblad, Experimentalfältet.

(Mit 1 Karte und 2 Textfiguren.)

Unsere Kenntnisse der Bach- und Quellenfauna Schwedens sind leider noch äusserst lückenhaft. Es liegt daher an und für sich nichts eigentümliches darin, dass ich einige neue schwedische Fundorte der interessanten *P. alpina* auffinden konnte. Die Art war aber bis jetzt nur für die nordschwedischen Gebirgsgegenden festgestellt, weshalb die südschwedischen Fundorte doch wohl ein gewisses Interesse beanspruchen können, umsomehr als es das erste Mal ist, dass die Alpenplanarie in Schweden relikt gefunden wird.[1])

Während einer Reise in Schonen im Herbste 1923, hauptsächlich um Quellenhydracarinen zu sammeln, besuchte ich die wegen des prachtvollen Wasserfalles und der eigenartigen, schönen Natur weit berühmte Forsakar-Gegend im östlichen Teil der Provinz. Ein grosser Bach fliesst in einer im Linderödsås eingeschnittenen, etwa 30 m tiefen, engen Kluft, deren Böschungen teilweise äusserst steil

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1) Es gebührt sich, an dieser Stelle einen herzlichen Dank an meinen lieben Lehrer und Freund, Herrn Prof. Dr. N. von Hofsten, Upsala, zu richten nicht nur für den besonderen Rat, nach Reliktlokalen dieser Tierart zu suchen, sondern vor allem dafür, dass er dazu beigetragen hat, das Interesse für tiergeographische Untersuchungen in mir zu erwecken.

Mein Freund Dr. Ivar Sefve, Falun, hat mir mitgeteilt, dass er *P. alpina* in der Nähe von Röros in Norwegen und im Kirchspiel Idre, Dalarna (teils auf dem Nipfjället, teils in einer kalten Quelle bei Klingforsen) gefunden habe. Die Wassertemperatur der Quelle betrug im Hochsommer + 5° C. Dieser letzte Fundort liegt in der Nadelwaldregion und kann nach Sefve als typische Reliktlokalität betrachtet werden. Diese drei Fundorte waren bis jetzt noch nicht publiziert; für die Mitteilung derselben spreche ich hier Dr. Sefve meinen verbindlichsten Dank aus.

abfallen und mit tiefem Schatten werfenden Buchen bewaldet sind. Beim Wandern den Bach hinauf erreicht man nach einem Kilometer das innere Ende des Tales, das von dem etwa 9 m hohen Wasserfalle vollständig gesperrt wird und ein weiteres Vordringen in dieser Richtung kaum erlaubt. An der rechten Seite des Baches

O. Lundblad phot.
Fig. 1. Der Forsakarbach in Schonen. Die Quellen liegen am rechten Ufer.

mündet ziemlich hoch oben an der erdigen, kahlen Böschung eine kleine Sickerquelle (Helokrene), die ganz vor kurzem (1923) durch künstliche Stauung in eine Limnokrene verwandelt worden ist. Weiter unten sickert natürlich das Wasser wie vorher und bildet so eine einige Zentimeter breite, nasse "Strasse" wenige Meter unterhalb der Quelle. Das Wasser versickert bald in den Boden ohne den Bach im Tal bei weitem zu erreichen. Das Quelloch wie auch die Abflussrinne enthielten zahlreiche, modernde Buchenblätter. Die zweite Quelle ist eine natürliche Limnokrene und vom Menschen ganz unberührt. Sie liegt unten im Tale nur einige Meter vom

Bachufer entfernt. Auch der Boden dieser Quelle ist reich mit modernden Buchenblättern bedeckt, und das Wasser roch sogar ein wenig nach Schwefelwasserstoff. Die Temperatur der beiden Quellen betrug am 11. Oktober 1923 um 6 Uhr nachmittags + 7° C. In beiden Quellen war *Gammarus pulex* äusserst zahlreich vorhanden, in der ersten auch *Planaria alpina,* wovon sicher einige hundert Exemplare zur Beobachtung gelangten (die grössten waren 13 mm lang), während in der zweiten Quelle nur wenige Planarien gefunden wurden. In der ersten erbeutete ich u. a. auch *Sperchon resupinus* Viets, in der zweiten *Ljania bipapillata* Thor, also zwei Milben von ausgesprochener Bach- oder Quellennatur. Die zweite ist jedoch entschieden keine typische kaltstenotherme Art und die erste bisher zu wenig beobachtet, als dass ich eine Vermutung betreffend ihre Optimaltemperatur wagen möchte.

Im folgenden Jahre 1924 besuchte ich wieder Schonen und fand *P. alpina* an zwei einander nahegelegenen, neuen Fundorten etwa 1 km nördlich von Forsakar, beide in der Nähe von Borråkra und etwa 40--50 m ü. d. M. gelegen. Die eine ist eine grosse, aber flache, steinige, sterile, unter Steinblöcken hervortretende Quelle (Limnokrene), die in einer kleinen, mit Buchen bewaldeten Senke liegt. Die Quelle enthielt einige Buchenblätter und gab einem kräftigen, zuerst über Weideplätze, dann in einer tief eingeschnittenen Rinne im Walde fliessenden, stark abfallenden Bach den Ursprung. Von Milben fand ich nur *Sperchon squamosus* Kram. und *thienemanni* Koen. *P. alpina* sass häufig auf der Unterseite von Steinen in der Quelle, weniger häufig dagegen im oberen Bachlauf, gar nicht im unteren. Die Temperatur der Quelle war + 6.2° C. am 7. Juli. *Gammarus* trat zahlreich auf. Der zweite Fundort ist eine kleine Limnokrene auf einer Wiese und, wie der aus ihr fliessende Bach, ganz offen liegend. Der Boden besteht aus Sand und Stein. Hier kommt keine Vegetation vor, wogegen der Bach von *Veronica beccabunga* und anderen Wasserpflanzen ganz durchgewachsen ist. Die Temperatur der Quelle betrug am 9. Oktober + 8.8° C. Von Milben fand ich nur *Sperchon, Gammarus* war häufig, und *Planaria alpina* sass zu Tausenden unter den Steinen. Die meisten Exemplare waren bloss 3—5 mm lang, nur ein paar 10 mm messende wurden beobachtet. Weder hier noch in den übrigen Quellen wurden geschlechtsreife Individuen gefunden.

Im Oktober 1924 besuchte ich auch die Skäralidgegend bei Söderåsen, doch ohne *P. alpina* zu finden. Der hier fliessende, grosse Bach, Skäraån, bietet der Art sicher nicht die erforderlichen Existenzbedingungen. Am Ufer fand ich zwar eine kräftige, sehr kalte Buchenlaublimnokrene, die aber ganz steril war. Vermutlich war sie, wie dies leider so oft der Fall ist, gereinigt worden, was

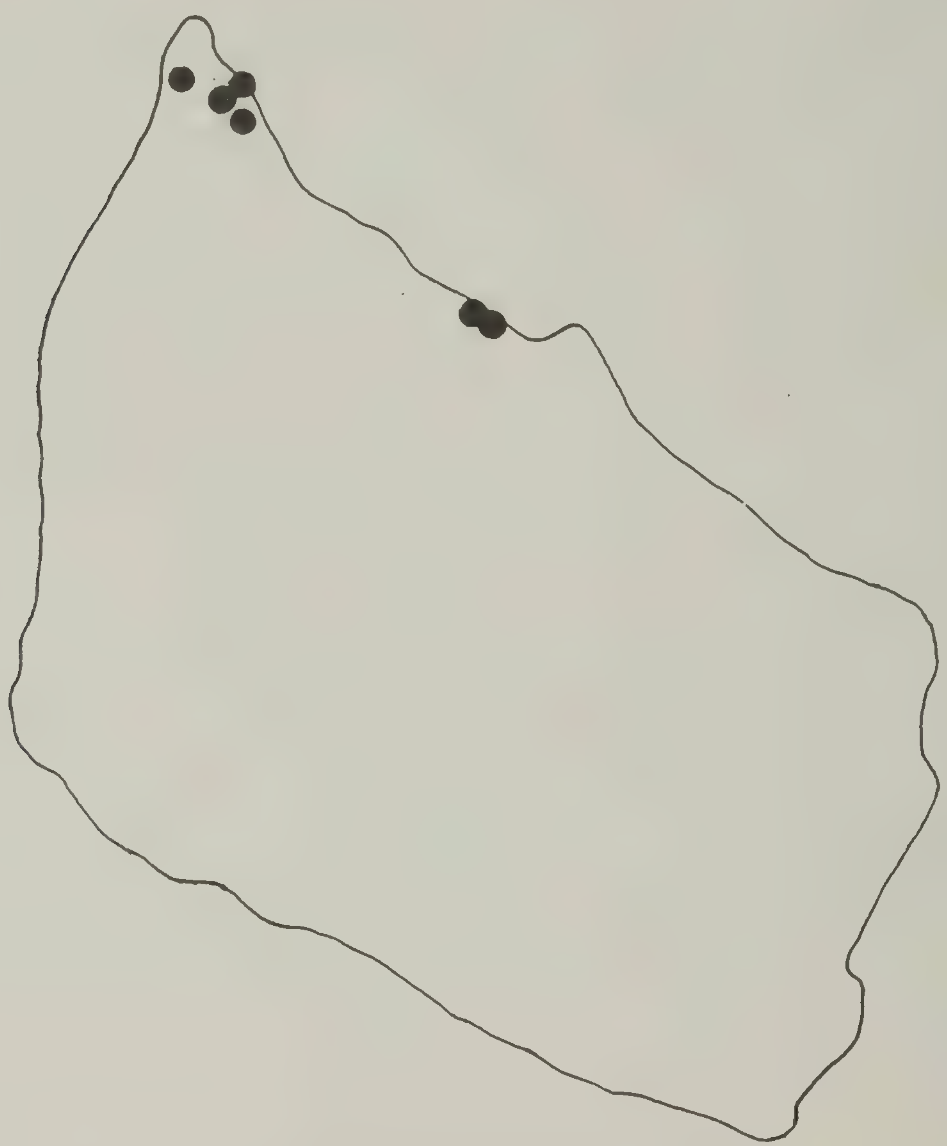

Fig. 2. Fundorte auf Bornholm für *Planaria alpina*.

ohne Zweifel eine schlechtin verwüstende Einwirkung auf die Reliktenfauna ausübt. Auch mehrere andere, etwa 5 km südlicher belegene Quellen enthielten keine Planarien, obgleich sie teilweise vom Menschen nicht berührt waren und auch kaltstenotherme Wassermilben beherbergten.

Während einer Reise nach Bornholm im Herbste 1924, wo ich besonders die Bäche und Quellen untersuchte, gelang es mir auch zwei Fundstellen für *P. alpina* zu entdecken. Die eine war — wie

ich später fand — identisch mit dem kleinen, schon von von Hofsten besuchten Bache an der Südwestecke des Hammersø, wo auch er *P. alpina* fand. Hofsten mass am 18.—19. Aug. + 14.2° C., während ich am 26. Sept. + 10.6° C. feststellen konnte. Hofsten erwähnt nur einen einzigen, kurzen Bach. Beim Emporklettern der Böschung fand ich aber, dass es zwar einen Hauptbach gibt, dass es sich aber eigentlich um ein Netz von kurzen, zusammenfliessenden Bachläufen (sogar um ein Morastgebiet) handelt. Ob *P. alpina* in allen vorkam, stellte ich nicht fest.

Die anderen von von Hofsten erwähnten Lokale wurden von mir nicht besucht. Dagegen fand ich *P. alpina* an einem neuen Fundort, nämlich in einem teilweise unterirdisch fliessenden Bache südwestlich von Allinge, der etwas südlich von der Stadt ins Meer fliesst. Die Temperatur betrug am 23. Sept. + 12° C. Die Würmer krochen am Schlammboden in einer Erweiterung des Baches oder sassen an den Steinen. Sie wurden nur in der Erweiterung gefunden, die unmittelbar bei einer Chausseebrücke etwa 400 m südwestlich von der Eisenbahnstation Allinge liegt. Der Bach fliesst offen über Äcker und Wiesen[1]) und der Fundort liegt etwa 40—50 m ü. d. M. Da die höchste marine Grenze in dieser Gegend in einer Höhe von etwa 18 m ü. d. M. dahinzieht, liegt der Fundort also bedeutend oberhalb dieser Grenze.

Da es nicht ohne Interesse ist, einiges über die Beschaffenheit des Wassers der Fundorte zu erfahren, habe ich den Sauerstoffgehalt, Eisengehalt, H_2S Gehalt, die Gesamthärte und die Wasserstoffionenkonzentration der betreffenden Gewässer analysiert und gebe hier eine Übersichtstabelle der von mir gefundenen Werte.

[1]) Hofsten glaubt, dass die Ursache zum Aussterben der Alpenplanarie im Walde Almindingen auf Bornholm darin zu suchen sei, dass der Wald einst verödet war (der heutige schöne Wald ist gepflanzt) und die jetzigen Waldbäche damals nicht kühl genug gewesen wären (1920, p. 42). Es mag bemerkt werden, dass zwei von mir besuchte Lokalitäten, nämlich der Allinge Bach und der eine der beiden Borråkrafundorte in ganz offenem Gelände liegen und dass wahrscheinlich hier in längerer Zeit kein Wald gewachsen ist. Es scheint mir recht plausibel anzunehmen, dass *P. alpina* doch in Almindingen lebt, obgleich sie sich bis jetzt der Entdeckung entzogen hat. Ob den urzeitlichen Wäldern generell wirklich die grosse Bedeutung zuzuschreiben sei, wie es Voigt und Thienemann tun ist vielleicht zweifelhaft.

Tabelle über die chemische Zusammensetzung des Wassers an de
untersuchten Orten.

	Datum 1924	Temp. des Wassers ^{0} C.	Luftdruck mm	O_2 pr l cm^3	Sauerstoffgehalt des mit Luft gesättigten Wassers cm^3/l	Sauerstoffmangel cm^3/l	H_2S-Gehalt	Eisen-Gehalt	Gesamthärte in deutsche Härtegrade
Forsakar (künstliche Limnokrene)	6.VII	+ 7.0	754	8.04	8.40	0.37	0	0	3.72
„ (Limnokrene)	6.VII	+ 6.9	754	7.48	8.42	0.94	puren	0	2.94
Borråkra (Limnokrene I)	7.VII	+ 6.2	753	6.70	8.56	1.82	0	0	5.06
„ (Limnokrene II)	9.X	+ 8.8	—	—	—	—	—	—	—
Hammersø (Bach)	26.IX	+10.6	760	7.37	7.76	0.39	0	Spuren	12.00
Allinge (Bach)	19.IX	+12.0	752	7.14	7.44	0.30	0	0	(? 3.20)

Wir finden, dass die Temperatur immer eine niedrige ist, was besonders von den drei ersten Fundstellen gilt, wo sie sicherlich nie über + 8^0 C. steigt[1]). Die höchste gemessene Temperatur zeigt der Allinge Bach. Wegen des teilweise unterirdischen Laufes ist es aber höchst wahrscheinlich, dass dieser Bach sich auch während des wärmsten Monats nicht über + 15^0 C. erwärmt.

Auch die Sauerstoffbestimmung, die ich nach der Winkler'schen Methode ausführte, lieferte recht interessante Werte. Es geht aus der Tabelle hervor, dass — bei der gemessenen Temperatur und dem Luftdruck — der Sauerstoffgehalt sehr hoch war, besonders wenn wir uns vergegenwärtigen, dass es sich in den drei ersten Fällen um Quellen handelt, und solche sehr oft niedrige Werte aufweisen. Als Beleg will ich hier nur eine grosse, von mir in Mittelschweden (Södermanland, Gryt) untersuchte Limnokrene anführen, die am 1. Juni 1924 bei einer Temperatur von + 5.9^0 C. nur 3.79 cm^3 O_2 pr l enthielt. *Planaria alpina* wurde dort nicht gefunden, wohl aber sehr interessante relikte Wassermilben. Doch liegt diese Quelle unterhalb der höchsten marinen Grenze. Möglicherweise beansprucht die Alpenplanarie einen relativ hohen Sauerstoffgehalt, doch scheint man nichts näheres hierüber zu wissen. Eine ausgesprochene Reinwasserart scheint aber unsere

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[1]) Am 9. Oktober 1924 betrug sie in der künstlichen Forsakarlimnokrene eigentümlicherweise nicht weniger als + 7.6^0 C.

Art zu sein. Der hohe O_2-Gehalt deutet an, dass keine faulenden Substanzen im Wasser vorhanden waren und dass das Wasser nicht aus moorigen Gebieten stammte, da die Humussubstanzen dem Wasser bekanntlich viel Sauerstoff entziehen. Auch von anderer Seite (von Hofsten 1908, p. 10—11) ist hervorgehoben worden, dass *P. alpina* humöse Gewässer wahrscheinlich nicht bewohnen kann. Möglicherweise wird dadurch auch die Tatsache erklärt, dass ich die Art niemals auf dem småländischen Hochlande nachweisen konnte, wo ich weit zahlreichere kalte Bäche und Quellen untersuchte; das Wasser ist in diesen Gegenden oft stark humös, deshalb oft auch weniger sauerstoffreich. Ebenso deutet die H_2S-Bestimmung, die nach Caro mit Paraamidodimethylanilin ausgeführt wurde, reines Wasser an. Nur in der mit moderndem Buchenlaube ganz zugeschütteten Limnokrene bei Forsakar zeigte sich in der dem Bodenwasser entnommenen Probe nach Verlauf von 15—30 Minuten eine sehr schwache, wenn auch deutliche Reaktion (gelbgrün). Der sehr hohe Sauerstoffgehalt der künstlichen Limnokrene beruht sicher auf dem teilweise tropfenden Zufluss dieser Quelle.

Eisen wurde im allgemeinen nicht gefunden, dagegen war das Wasser in gewissen Fällen (Hammersø) sehr hart. Für den Allinge Bach ist der gefundene Wert der Gesamthärte (nur 3.20 deutsche Härtegrade) nicht zuverlässig. Vielleicht ist dies einem ungewöhnlich hohen Gehalt an Magniumsalzen zuzuschreiben, da er normalerweise höchst bedeutende Salzmengen führen muss. Die Steine im Bachbette waren nämlich von dicken Kalkkrusten überzogen, und die wenig vorhandenen Moospflänzchen starkt verkalkt, brüchig und von Kalkrörchen umgeben. Die Härtebestimmung wurde nach Clark ausgeführt.

Sämtliche untersuchte Gewässer waren alkalisch, am meisten die beiden Bornholmer Bäche, was natürlich in ihrem hohen Kalkgehalt seinen Grund hat. Die Wasserstoffionenkonzentration wurde mit Clark's Indikatoren kolorimetrisch festgestellt.

Über *Planaria alpina* ist schon eine ganze Literatur emporgewachsen, die ich nur teilweise aus eigener Anschauung kenne. In Schweden wurde sie zum ersten Male von von Hofsten 1907 (l. cit. 1908) nachgewiesen, und sie ist seitdem an mehreren Orten

in den nordschwedischen Hochgebirgen festgestellt worden, ebenso in den norwegischen wie auch in Nordfinland (von Hofsten 1916). Sie hat bei uns im Norden wohl eine im grossen und ganzen zusammenhängende Verbreitung bis in die Gebirge von Härjedalen, wo sie von mir gefunden wurde [1]). In Südschweden wurde sie bis jetzt nicht beobachtet. Das andere zusammenhängende Verbreitungsgebiet der Art umfasst bekanntlich die Alpen, wo sie auch sehr häufig ist. Zwischen diesen beiden Hauptverbreitungszentren kommt ja die Alpenplanarie auch an einer grossen Anzahl isolierter Punkte vor. Sie ist auch für die Ostseeinseln Rügen, Bornholm und Møen nachgewiesen [2]).

Planaria alpina bekundet eine ausgesprochene Vorliebe für kaltes Wasser und wurde in der Ebene immer nur in sehr kalten Quellbächen oder Quellen beobachtet (immer unter $+ 15^0$ C.). Da sie also nur die obersten Bachläufe bewohnt, und die aktive wie passive Verbreitung der Art unter den heute in diesen Gegenden herrschenden Klimaverhältnissen als äusserst geringfügig betrachtet werden muss, hat man sie hier als Glazialrelikt aufgefasst. Diese Annahme ist vielleicht für *P. alpina* besser gegründet als für die meisten anderen, als Glazialrelikte in Anspruch genommenen, kaltstenothermen Süsswassertiere. Auch die von mir in Schonen entdeckten Kolonien sind derartige, ganz isolierte, durch die gesteigerte Temperatur bis in die Quellen verdrängte, kleine Bestände, die sich an diesen Stellen seit der Eiszeit zu erhalten imstande waren. Heute sind, wie gesagt, die Kolonien isoliert. Die künstliche Limnokrene versickert, wie schon hervorgehoben, bald in den Boden und steht mit dem Bache nicht in Verbindung. Es ist daher ganz ausgeschlossen, dass die Kolonie sich etwa aus dem Bache rekrutieren könnte, ganz abgesehen davon, dass *P. alpina* das Leben im Bache nicht zu fristen imstande ist. Dazu ist sicherlich die Temperatur im Sommer so hoch, vielleicht auch die Wasserführung infolge der Anlage mehrerer Wassermühlen zu variabel. Obgleich

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[1]) Mein Fundort ist auf der Karte mit einem Fragezeichen versehen, weil die Tierchen nicht in lebendem Zustande bestimmt und näher untersucht wurden. Höchst wahrscheinlich handelte es sich aber um *P. alpina*.

[2]) Lampert (1923, p. 371) hat sie auch für die Nordseeinsel Helgoland angegeben, was aber nach Thienemann (1912 p. 120, Fussnote) wahrscheinlich auf einem Irrtum beruht.

die andere Forsakarquelle mit dem Bache in offener Verbindung steht, kann *P. alpina* also auch in diesem Falle, weil in dem Bache nicht vorhanden, nicht in der postglazialen Zeit in die Quelle eingedrungen sein, sondern muss auch hier schon seit dem Ende der Eiszeit gelebt haben.

Die schonenschen sog. Åsar: Romeleåsen, Söderåsen und Linderödsåsen, sind hoch über die Ebene emporragende Urgebirgspartieen, die vom spät- oder postglazialen Meere niemals bedeckt waren. Wohl aber wurde der Fuss des Linderödsås, der uns hier ausschliesslich interessiert, vom baltischen Eissee gespült. Dieser See erreichte hier eine Höhe von 43 m ü. d. M. und drang also bis in die Nähe der Forsakarquellen vor, die in etwa 50—60 m Meereshöhe liegen dürften. Da das spätere Meer niemals bis hierher reichte, kann *P. alpina* in den fraglichen Quellen als Relikt im engsten Sinne des Wortes (Primorelikt, Jägerskiöld 1912) angesehen werden, also als ein eben in diesen Quellen zurückgelassenes Überbleibsel aus der Eiszeit.

Dasselbe gilt von den Borråkraquellen, die etwa 40—50 m ü. d. M. liegen. Nach Munthe's Untersuchungen (Munthe 1910, Karte 2) erreichte das spätglaziale Meer hier etwa diese Höhe, so dass diese Quellen ganz an der höchsten marinen Grenze sich befinden. Auch in diesem Falle also können wir die Art als Primorelikt betrachten.

Andere Tricladen wurden in den Quellen (mit Ausnahme von *Dendrocoelum lacteum* in einigen davon) nicht gefunden. Bei Forsakar fand ich auch eine kleine, weisse Planarie, die kaum etwas anderes als *P. vitta* Dugés sein kann. Die Kopfform stimmte ganz mit der von Thienemann (1907b Seite 16) gegebenen Abbildung überein. In Deutschland, wo die Verbreitung der *P. alpina* und die Beziehungen derselben zu anderen Tricladen näher erforscht sind, lebten im allgemeinen unterhalb der von *alpina* besetzten Zone *Polycelis cornuta* und *Planaria gonocephala*, oder die eine dieser Arten hatte sogar *P. alpina* verdrängt, wie aus Voigt's klassischen Untersuchungen und auch aus denjenigen Thienemann's hervorgeht. Der Hauptbach wurde von mir nicht näher untersucht, so dass ich über ein eventuelles Vorhandensein dieser beiden Arten in ihm nichts sicheres sagen kann. Weder *P. cornuta* noch *P. gonocephala* wurden aber bis jetzt in Schweden

gefunden. Auch wenn *P. gonocephala* im Bache vorhanden wäre, würde sie dennoch wahrscheinlich durch Hinaufwandern der Alpenplanarie den Platz nicht streitig machen können. Voigt hat nämlich in seiner bekannten Studie (1895 p. 157—158) zeigen können, dass diese Art nicht imstande ist, mit Buchenlaub mehr oder weniger stark verschüttete Quellen und kleinste Rinnsale zu besiedeln, was auf verschiedenen Ursachen (Befestigung der Eierkokons, Beschaffenheit des Wassers) beruht. Auch die beiden von mir bei Forsakar besuchten Quellen enthielten zahlreiche Buchenblätter, so dass der Boden von einer dezimeterdicken Schicht bedeckt war. Was *P. gonocephala* betrifft, ist es wohl äusserst wahrscheinlich, dass sie in Schweden überhaupt nicht vorkommt. Sie lebt weder auf Bornholm noch auf Rügen, vermutlich weil sie erst in historischer Zeit — nach der subatlantischen Klimaverschlechterung — angefangen hat, sich energisch weiter zu verbreiten, jedenfalls erst zu einer Zeit, wo die erwähnten Inseln wie auch Südschweden von der norddeutschen Küste bzw. Dänemark bereits abgetrennt waren. Hierdurch erklärt sich wohl auch das Fehlen von gewissen anderen Süsswassertieren in Schweden, z. B. *Niphargus*, den man auf Rügen und auf Bornholm vermisst. Freilich wurde nach dieser Art bei uns nicht besonders gesucht, weder von mir noch von anderen Forschern. Es dürfte wohl das Fehlen der Art bei uns feststehen, was in solchem Falle sicher darauf beruht, dass die skandinavische Halbinsel nicht mehr mit Dänemark zusammenhing, als der Kruster das baltische Gebiet erreichte[1]).

Voigt bemerkt, dass *P. alpina* mehreren ungünstigen, äusseren Einflüssen gegenüber sehr resistent ist. Er konnte die Planarie sehr lange in einem übelriechenden, nicht durchlüfteten Aquarium

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[1]) Obgleich es keine grössere Beweiskraft hat, erlaube ich mir mitzuteilen, dass ich im Jahre 1923 die eigentümliche, im Kalkgebirge Balsberget in Schonen befintliche, unterirdische, grosse Grotte, die kaltes Wasser enthält, eingehend untersucht habe, ohne das Tier zu finden. *P. alpina* kommt auch gelegentlich unterirdisch vor und scheint unter diesen Verhältnissen in Südeuropa sogar neuen "Arten" den Ursprung gegeben zu haben. Da diese Formen bis jetzt nur wenig untersucht sind, lässt sich der systematische und genetische Wert derselben zur Zeit nicht überblicken. Auch in gewissen Lokalitäten auf Rügen lebt die Art, wenigstens zeitweise, nach Thienemann, unterirdisch. In der wassererfüllten Grotte des Balsberget fand ich aber keine Planarien.

am Leben halten. Ich kan diese Beobachtung durchaus bestätigen. Ich hielt die Tiere 4 Tage lang in einer flachen, grossen Schale mit stinkendem Wasser, ohne dass sie aufhörten, munter herumzukriechen. Beinahe alle anderen Tiere, besonders alle *Gammarus*, waren schon längst eingegangen. Es ist dies gewiss recht eigentümlich und bei einem Glazialrelikte unerwartet, aber unsere Auffassung der Art als eines auf die Dauer kühles und auch relativ reines und frisches Wasser beanspruchenden Tieres braucht durch die obige Beobachtung nicht im geringsten erschüttert zu werden. Für den Ausgang bedeutungsvoller als solche im Versuch eintretende, stürmische Verschlechterungen des Mediums sind wohl in der Natur sicher die kleinen, oft nur durch sorgfältige Untersuchungen festzustellenden, aber fortwährend andauernden und daher in die Wechselbeziehungen der Tiere untereinander auch tiefer eingreifenden Veränderungen. Es lässt sich ebenso bei gewissen anderen Glazialrelikten, bzw. kaltstenothermen Tieren zeigen, dass die erwachsenen Tiere oder ihre Entwicklungsstadien, oder sogar beide, vorübergehenden, aber vielleicht eine oder wenige Generationen andauernden Temperatursteigerungen gegenüber sich unerwartet widerstandsfähig verhalten. In der Natur aber braucht bei der Konkurrenz mit anderen Arten das nicht mehr zuzutreffen, und das Ergebnis kann ein ganz anderes werden.

In allen Quellen trat *Gammarus*, obgleich in verschiedener Anzahl, auf. Da *P. alpina* sich hauptsächlich von *Gammarus* ernährt, kann das reichliche (bzw. äusserst reichliche) Vorhandensein dieser Beute das zahlreiche Auftreten der offenbar gut ernährten Planarien erklären.

Zum Schlusse möchte ich auch bei dieser Gelegenheit eine Frage, die mit dem Auffinden der Alpenplanarie in Schonen in Zusammenhang steht, kurz berühren, nämlich ihre Einwanderung nach Skandinavien.

Schon von Hofsten hat diese Frage bei seinen Untersuchungen über die schwedische Turbellarienfauna mehrmals behandelt. Im Norden ist ja die Art für Norwegen, die nordschwedischen Hochgebirge und Nordfinland festgestellt worden. In seiner Behandlung der Einwanderungsfrage sagt von Hofsten in seiner letzten Arbeit (1916 p. 725): „Man hat einstimmig vorausgesetzt, dass sie unsere

Hochgebirge vom Süden her erreicht hat. Diese Annahme liegt sehr nahe (da sie in fliessendem Wasser lebt, braucht sie nicht zu denjenigen glazialen Organismen zu gehören, deren südschwedische Stämme ausstarben), doch kann die Möglichkeit einer Einwanderung ausschliesslich aus dem Nordosten nicht mit Sicherheit ausgeschlossen werden."

Da die Art nun aber auch für Südschweden festgestellt ist, muss als sicher angesehen werden, dass die klimatischen und geologischen Verhältnisse nach der Eiszeit einst derartig günstig waren, dass sie die Einwanderung der Alpenplanarie nach Südschweden vom Süden her zuliessen. Und da es auch ein südliches Einwandererkontingent der *P. alpina* in Schweden gibt, fragt es sich nun, wann die Einwanderung derselben stattfand und ob die Feststellung der südschwedischen Reliktenkolonien irgendwie unsere Auffassung vom Einwanderungswege der nordschwedischen Bestände beeinflusst. Einige kurze Bemerkungen seien wohl daher hier am Platze.

Wir wissen ja, besonders durch Munthe's Untersuchungen, dass bald nach dem Abschmelzen des Inlandeises von Südschweden die Ostsee dadurch ein Binnensee wurde, dass Schonen mit Dänemark in feste Landverbindung trat. Der See war gegen Norden durch Eismassen aufgestaut und wird daher der erste baltische Eissee genannt. Das Klima während dieser Zeit war natürlich arktisch, obgleich eine Verbesserung sich schon etwas bemerkbar machte. Später wurde der Eissee in das Zanichelliameer verwandelt, das wohl aber, trotz seines Namens, wenigstens hier im Süden beinahe süsses Oberflächenwasser hatte. Diesem Meere folgte der zweite baltische Eissee, der seinerseits in das Yoldiameer überging. Nach dem Aufhören dieses Stadiums bildete sich der Ancylussee.

So viel ich sehe, muss die Einwanderung der *P. alpina* nach Südschweden schon während der baltischen Eisseezeit stattgefunden haben. Die klimatischen und geologischen Verhältnisse waren ja damals besonders günstig, jedenfalls günstiger als später. Schon während der Yoldiazeit und noch mehr während der ihr folgenden Ancyluszeit (während der letzteren stand Südschweden mit Dänemark in Verbindung) trat eine schnelle Verbesserung des Klimas ein. Man hat auch vermutet, *P. alpina* könnte sich möglicherweise längs den Ufern des Ancylussees verbreitet haben. Obgleich die

Art bei uns heute nur Bäche, nicht Seen bewohnt, lebt sie doch heute in den Seen der Hochalpen recht häufig (Zschokke 1900) und es wäre daher wohl nicht ausgeschlossen, dass sie, wie die Schnecke *Ancylus fluviatilis*, die heute in Bächen, während der Ancyluszeit aber häufig im Ancylussee lebte, auch in diesem See vorkommen konnte, falls die übrigen Verhältnisse dafür günstig waren. Wie von Hofsten aber bemerkt (1916 p. 724) war die Temperatur während der Ancyluszeit zu hoch. Eine Verbreitung der Art gegen Norden den Ufern des Ancylussees entlang muss daher als ausgeschlossen angesehen werden.

Die sehr früh eingewanderte *Planaria alpina* dürfte sich, dem zurückweichenden Eisrand folgend, weiter nach Norden verbreitet haben. Es fragt sich aber, ob sie sich allmählich verbreitend auch Nordschweden erreichen konnte und ob sie dem jetzigen dort lebenden Planarienbestand möglicherweise den Ursprung gegeben hat. Gewisse, nicht zu unterschätzende Hindernisse stellten sich freilich hier der Verbreitung gegen Norden in den Weg. Beim Abschmelzen des Inlandeises von Mittelschweden zog sich hier ein Meeresarm quer über das Land. Da dieser 100—150 kilometer breit war, ist an aktive Wanderung während dieser Zeit nicht zu denken, wenn nicht eine solche Wanderung schon über das noch mehr oder minder zusammenhängende Inlandeis möglich gewesen wäre. Eine solche Annahme bleibt doch wohl immer recht hypothetisch. Auch wenn man mit von Hofsten eine Möglichkeit passiver Verschleppung (natürlich nur in arktischer Umgebung) zugibt, ist wohl eine solche Annahme hier nicht besonders wahrscheinlich. An eine Verbreitung während dieser Zeit, die in klimatischer Hinsicht die günstigste war, ist daher nicht zu denken. Wir wissen, dass das Klima sich während der folgenden Zeit, ja schon während der späteren Yoldiazeit, schnell verbesserte, so dass u. a. die arktischen Landpflanzen sich nördlich der Meeresstrasse nicht verbreiten konnten. Die arktische Süsswasserfauna dagegen, insbesondere die Quell- und Bachfauna, war natürlich nicht so ungünstig gestellt, und höchst wahrscheinlich gab es, nachdem eine feste Landverbindung hier in Mittelschweden eingetreten war, noch zahlreiche kühle Gewässer, die ein Vordringen unserer Art übers Land gestatteten. Wir wissen ja auch, dass der grösste Teil Finlands während der spätglazialen Zeit unter dem Meeresoberfläche

lag und dass sich dort nur eine reich entwickelte Inselwelt befand, weshalb sich auch in diesen Gegenden der Verbreitung gegen Norden Hindernisse entgegenstellten.

Durch diese Erwägungen kann natürlich nicht mit voller Sicherheit behauptet werden, dass die Alpenplanarie Nordschweden vom Süden her erreichte, nur macht der südschwedische Fund diese Möglichkeit etwas wahrscheinlicher. Nur eine nähere Untersuchung derjenigen Gegenden Mittelschwedens, die nördlich dicht an der ehemaligen Meerenge und in dieser Meerenge selbst liegen, kann die endgültige Entscheidung bringen. Von Hofsten neigte ja, wie erwähnt, am meisten der Meinung zu, dass *Planaria alpina* wahrscheinlich von Nordosten her Nordschweden erreichte, und das Berechtigte an dieser Ansicht soll nicht bestritten werden. Doch scheint es mir sehr wohl möglich, dass *P. alpina* beide Einwanderungswege nach Nordschweden benutzt hat, so dass doch ein Teil der nordschwedischen Planarien von Süden her gekommen sind. Die Lösung dieser Frage hängt meines Erachtens ganz davon ab, ob in der Zukunft *P. alpina* in Mittelschweden wesentlich unterhalb der höchsten marinen Grenze relikt gefunden wird. Dass hier andere glaziale Süsswassertiere relikt leben — ich sehe natürlich in diesem Zusammenhange ganz von den maringlazialen ab — ist sicher.

Verzeichnis der bisherigen, nordischen Fundorte der Planaria alpina.

Dänemark: Møen (3 Fundorte, Brinkmann, Lundblad); Bornholm (5 Fundorte, von Hofsten, Lundblad).

Norwegen: Röros (Sefve); Bergen (Thienemann); Finse; Haukelisæter; östlich Narvik an der norwegisch-schwedischen Grenze (von Hofsten).

Finland: Pallastunturi; Ailigastunturi; Utsjoki (Luther).

Schweden: Schonen (2 Fundorte bei Forsakar, 2 bei Borråkra, Lundblad) Dalarna (Klingforsen und Nipfjället, Sefve); ? Härjedalen (Bruksvallarna, Lundblad); Jämtland (Åreskutan und Storlien, von Hofsten); Lappland (Sarekgebirge, zahlreiche [etwa 15] Fundorte; Zufluss des Lule-Älv; Torneträskgegend, zahlreiche Fundorte, von Hofsten).

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Nachtrag während der Korrektur.

Während eines Besuches auf Møen im Herbste 1925 fand ich *P. alpina* auf einer neuen Lokalität, nämlich im Bache im Jydelejet; ausserdem konnte ich sie an den beiden Fundorten Brinkmann's beobachten.

18—11—1925

Die bisher bekannte Verbreitung von *Planaria alpina* im Norden; *Regio alpina* punktiert.

An Apparatus for catching the Micro-Fauna of the Sea-Bottom

by

Dr. Th. Mortensen.

For a long time I have realized the difficulty of securing the various small organisms which live in the upper layers of the sea-bottom, especially in the fine layer of detritus that covers the bottom in places, where it is not swept by the currents.

The important role that the detritus plays in the ecology of the sea has especially been made known through the work carried on at the Danish Biological Station by Dr. C. G. Joh. Petersen, Dr. H. Blegvad and Dr. P. Boysen-Jensen (cf. especially the Reports from the Danish Biological Station XX, 1911; XXII, 1914 and XXV, 1918). As a matter of fact the detritus forms the main source of food for the immense number of non-predaceous organisms of the sea-bottom.

The researches of the said authors are in the main confined to the larger, non-microscopical organisms. We know, however, that also minor or microscopical organisms occur in immense numbers on the sea-bottom, where they may be assumed to live especially in the uppermost layer, above all in the detritus layer, i. e. in the midst of their food. The access to the study of these organisms has hitherto been rather difficult. When the trawl comes up filled with bottom material, the small organisms af the upper layer are swamped in the mass of mud or sand. Sifting the content of the trawl through a sieve of fine silk gauze will permit to get hold of some of the small organisms, and this method was especially used during the "Ingolf" Expedition at the instigation of Dr. H. J. Hansen, and fine results were achieved in that way. I have also used it myself on my various expeditions to the tropical seas. But, of course, only a very small percentage of the microfauna of the

bottom is secured by this means, simply because sifting in this way more than a small sample of the contents of a full trawl would be an insuperable task.

Another way to secure this microfauna is to skim the upper layer from samples taken up by means of Dr. Petersen's bottom grap. Here the upper layer may be had fairly undisturbed, and, evidently, it will be possible by this means to get a fair knowledge of the quantity of micro-organisms in the upper layer of the bottom. More undisturbed this layer is brought up by means of the glass-tubes also used by Dr. Petersen for the study of bottom samples. These methods may well suffice for the quantitative study of the bottom-fauna. But for the naturalist who wants to study these organisms from a morphological or classificatory point of view or who wants to gain as complete a knowledge as possible of the various species occurring im some place, and therefore wants to have a large material of the various forms at his disposal, these methods are very unsatisfactory.

The problem of an effective method of catching the micro-organisms of the sea-bottom, not for quantitative but for qualitative study, has occupied me for some time. While investigating the fauna of the sandy beaches of the Danish Coasts ("Biologiske Studier over Sandstrandsfaunaen, særlig ved de danske Kyster". Vid. Medd. Dansk Naturh. Foren. Bd. 74, 1921.) I tried to skim off the upper bottom-layer in places sheltered from the wave action, — e. g. on the large muddy flats ("Vader") at Fanø, off the West coast of Jutland, and to sift the material through a fine silk net. The result proved quite up to my expectations, a very rich fauna of small organisms: Nematods, Copepods, Ostracods, Infusoria etc. being found to inhabit this layer. Extending this study also to places, where the bottom was sand, e. g. the extensive sandy flats with Cyanophyceæ off the Southend of Læsø in Kattegat, I had, of course, to modify the method, as the net to be used for sifting must be too fine-meshed for permitting the sandgrains to pass through. The upper layer to about a centimeter's thickness was peeled off and put into a bucket with water, to which was added some formalin. It was then all stirred well round and allowed to settle. The sand sinking first to the bottom leaves the finer detritus and all the minor, lighter organisms floating, while the water is

still in movement, and the water with the detritus and the organisms may then be sifted off. On repeating the process one may, of course, secure a much greater percentage of the organisms found in the sand. The result was again fully up to the expectations, an enormously rich fauna of small organisms e. g. Nematods, Planarians, Ostracods, Copepods (especially Harpacticids) and Infusorians being found to inhabit this upper layer of the sand. — The same method was also used on the sandy beach of the West coast of Jutland, where the waves of the North Sea beat with full force — and even here a rich fauna of micro-organisms was found to live in the sand. (Unfortunately there has been no opportunity of having all this rich material worked up).

During the Danish Expedition to the Kei-Islands I used this method of sifting through a fine silk net samples of the upper layer of the bottom on localities of various character (— muddy flats, sandy flats etc. —) always with very fine results — but with regard to the microfauna of the bottom at greater depths there was only the old, unsatisfactory method of sifting small samples of the contents of the trawl through a silk net.

Last year, on seeing a friend of mine using an apparatus devised for the purpose of catching micro-organisms from the bottom (cf. Ruttner. "Über einige bei der Untersuchung der Lunzer-Seen verwendete Apparate und Gerätschaften". Internat. Rev. Hydrobiol. VI. 1913, p. 60—61) I was again led to take up the problem, not thinking the said apparatus sufficiently efficient for my purpose. The apparatus which I shall here describe (Fig. 1) was the result of my considerations.

The first claim, evidently, is this that the apparatus must be prevented from sinking too deep down into the soft mud. This is obtained by means of a thin zinc-plate, bent upwards at the anterior end like the runner of a sledge. But in order to prevent the risk of the apparatus coming down on the wrong side, a pair of such plates are fixed together, so that both sides are acting equally well. Between the two plates a silknet is hung, attached to a rectangular frame, which is fixed to the anterior edge of the plates by means of a string; for this purpose there is a hole at each side of the plate at the upwards bent edge. The two plates are connected with each other at the anterior end only in this

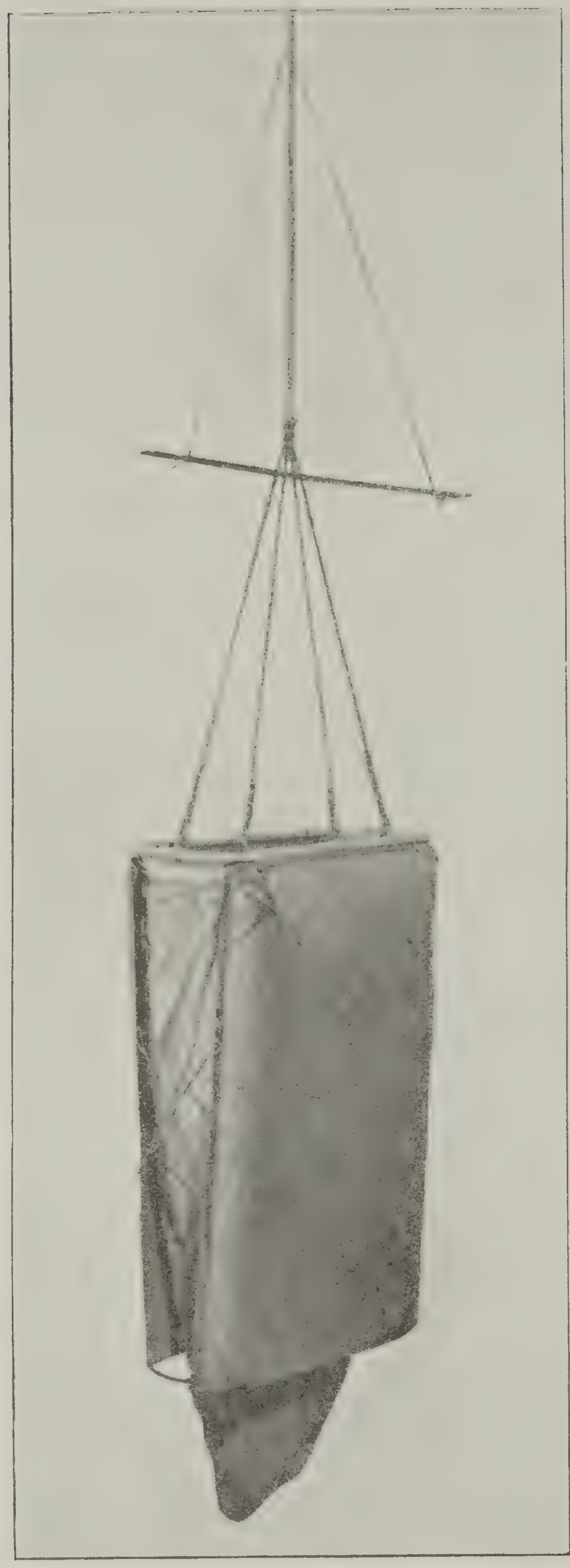

Fig. 1.

way, at the posterior end by means of a piece of iron wire. As this is, however, not sufficient for keeping the plates in position, a pair of wires are fixed cross-wise on one side of the apparatus, between the sides of the plates. In this way the plates are held perfectly in the right position.

This apparatus was found excellently fit for the purpose of catching the microfauna of the upper layer on a soft, muddy bottom. But it was, of course, desirable that it might be used also on a sandy bottom. For this purpose an iron rod is attached at a little distance from the mouth of the apparatus. When dragged over the bottom this rod stirs up the upper layer; while the sand grains soon sink to the bottom again, the finer material and the small organisms remain floating long enough for being caught by the aftercoming apparatus. (As a matter of fact more or less of the sand is also caught by the net; when too much sand is caught for preserving the whole sample, it may be treated as mentioned above). — It was soon found that it was as well to have the iron rod attached to the line also when the apparatus is used on soft bottom.

During the summer of 1924 I had the opportunity of trying

the apparatus a few times in the Limfjord and later on in the Great Belt, from the "Japetus Steenstrup", the steamer of the Danish Biological Station. This summer (1925) on a trip from Nyborg to Bornholm with the "Japetus Steenstrup" I had a much better opportunity of testing the apparatus, using it on a series of stations at various depths, down to 94 Meters. The result was so excellent that I have thought it my duty to publish this description of the apparatus in order to call the attention of other biologists to this method of securing material of the smaller bottom-dwelling organisms.

The organisms found were especially Nematods, Planarians and small Annelids; further Ostracods and bottom forms of Copepods; likewise small Molluscs, especially young Bivalves. The Baltic having, as well known, through its character as a brackish sea, only a very poor fauna, the result was, in fact, rather beyond expectation. There is reason to mention especially the somewhat unexpected discovery that the stinking mud from the greater depths N. E. of Bornholm (c. 80—90 Meters) proved to contain quite a rich fauna of Nematods (but very few other animals). Further it may be mentioned that *Echinoderes* was found to be quite common both in the Limfjord and the Great Belt. — That the use of this apparatus in richer localities will yield a very rich harvest in all sorts of small bottom-organisms cannot be doubted. To the above named groups will be added especially Cumaceans (found in great numbers by using the apparatus on sandy bottom in the Great Belt), Amphipods, Foraminifera, young Echinoderms etc. Especially we may look forward with the greatest expectations to using this apparatus in tropical seas.

As for using it in deep water this would hardly offer any special difficulties. Using it in a depth af 94 Meters in the Baltic proved to be very easy, and I do not see why it should be more difficult to use it in much greater depths. It will only be necessary to attach a heavier lead on the line some distance before the apparatus in order to make sure that the light apparatus really follows the bottom. This lead also makes it easier to feel with the hand on the line, when the apparatus has reached the bottom, and if it follows the bottom. I have therefore found it practical to attach

a small lead to the line also when using the apparatus in smaller depths.

In my opinion this apparatus will be indispensable for the student of such groups as Free-living Nematods, Ostracods, bottom-Copepods, Cumaceans etc.; upon the whole we will, no doubt, thereby obtain a much fuller knowledge of the small, more or less microscopical organisms which inhabit the upper layer of the sea-bottom, be it now a soft, muddy, or a hard, sandy bottom. (On a rocky or stony bottom the apparatus cannot be used). As regards the exact quantity of these organisms the apparatus will, of course, give a wrong conception, just as the dredge or the trawl gives an unreliable conception of the quantity of the larger organisms. For the exact, quantative study of the bottom-organisms Dr. Petersen's bottom-grap is and remains the means. But for the qualitative study of the smaller organisms of the sea-bottom the present apparatus will, I think, be as indispensable as is the dredge or trawl for the qualitative study of the larger organisms of the sea bottom.

That the apparatus will be fit for using also in fresh-water I should think beyond doubt. I have had no opportunity, however, for testing it in greater depths in fresh-water. A single trial in shallow water (in the Tjustrup lake, at Sorø, at Professor Wesenberg Lund's laboratory) did not give any noteworthy results; but conditions happened to be so exceptionally unfavourable, that it is hardly justifiable to draw any conclusions from that single experiment.

The silk gauze which I have used for the net is No. 10; this I have found very practical for sifting off the fine detritus and mud, so as to get the organisms as pure as possible. No doubt, however, a lot of minute organisms go through the meshes of the gauze of so coarse a number; but it is, of course, easy to use nets of various fineness, just as in plankton nets. Also it will be easy to make the apparatus of any desired size. (The size which I have used is this: length of plates 50 cm, breadth 35 cm).

The apparatus described above was constructed especially for folding together, so as to be easily carried; when that is not especially desired, the fixing of the plates may be made permanent, and more simple. It may also be suggested that, for the sake of securing the silknet against being torn or too much worn, it

would be practical to have it enclosed in a bag of usual fishing net — e. g. also for the case that it should be too full of mud or sand, so that it would be in danger of breaking. It might further be practical to have the frame of the silknet attached to the plates by means of a spring, instead of tying it with a string, so that it might easily be lifted up, which would facilitate both the sifting of the material and the changing of the net. — These are, however, all minor points. The main thing is the general system here used. I venture to think that this really means a practical solution of the problem of catching the micro-fauna of the sea-bottom.

XII.—1925.

Fuglene ved de danske Fyr i 1923.

41de Aarsberetning om danske Fugle.

Ved
R. Hørring.

I 1923 indsendtes fra 43 af de danske Fyr og Fyrskibe til Universitetets zoologiske Museum ialt 2521 Fugle af 72 Arter, faldne om Natten i Træktiderne. Sikker Efterretning haves om 3423 artsbestemte Fugle, idet Prøver af disse ere indsendte. Ifølge Fyrmestrenes Oplysninger, der dog desværre ikke have været ledsagede af indsendte Prøver, er yderligere opsamlet 184 Fugle, hvoraf 3 angaves at være Knortegæs, 1 en Ederfugl, 5 Vadefugle, 40 Lærker, 63 Drosler, 8 Solsorter og 64 forskellige Smaafugle. Nøjere Efterretning haves saaledes om 3607 Fugles Død ved Fyrene. Endelig angives c. 1000 Fugle at være faldne udenbords. I det hele synes der saaledes, at regne efter de indkomne Oplysninger, mindst at være faldet c. 4600 Fugle.

De Fyr, hvorfra Fugle indsendtes, vare:

Graadyb Fyrskib. C. C. Hansen, Fører (87 Fugle fra 22 Nætter).
Blaavands Huk Fyr. C. G. Christensen, Fyrmester (483 fra 22 Nætter).
Vyl Fyrskib. A. Rasmussen, Styrmand (130 fra 67 Nætter).
Horns Rev Fyrskib. C. E. Søjborg, Overstyrmand (102 fra 30 Nætter).
Lyngvig Fyr. C. A. Hansen, Fyrmester (367 fra 14 Nætter).
Bovbjerg Fyr. S. J. L. Beldring, Fyrmester (29 fra 2 Nætter).
Lodbjerg Fyr. J. A. Tendal, Fyrmester (13 fra 5 Nætter).
Hanstholm Fyr. E. N. Holm-Hansen, Fyrmester (20 fra 2 Nætter).
Rubjerg Knude Fyr. C. V. Fiedler, Fyrmester (4 fra 1 Nat).
Hirtshals Fyr. J. Johnsen, Fyrmester (5 fra 3 Nætter).
Skagen Fyr. V. Christensen, Fyrassistent (22 fra 5 Nætter).

(1923)

Hirtsholmen Fyr. J. N. B. Høeg, Fyrmester (12 fra 4 Nætter).
Læsø Trindel Fyrskib. S. Winther, Fører (30 fra 6 Nætter).
Læsø Rende Fyrskib. Aug. Jacobsen, Styrmand (10 fra 5 Nætter).
Østre Flak Fyrskib. A. Porse, Fører (30 fra 10 Nætter).
Hals Barre Fyr. A. P. Jensen, Fyrmester (5 fra 3 Nætter).
Egense Bagfyr. A. P. Jensen, Fyrmester (7 fra 1 Nat).
Anholt Knob Fyrskib. S. H. Jensen, Fører (37 fra 14 Nætter).
Anholt Fyr. M. P. Andersen, Fyrassistent (172 fra 8 Nætter).
Hesselø Fyr. K. A. Jensen, Fyrmester (137 fra 16 Nætter).
Schultz's Grund Fyrskib. T. A. Ross Due, Fører (75 fra 25 Nætter).
Hjelm Fyr. H. A. H. Nielsen, Fyrmester (56 fra 5 Nætter).
Sejrø Fyr. Chr. Adriansen, Fyrmester (39 fra 3 Nætter).
Vestborg Fyr. H. Tidemand, Fyrmester (28 fra 8 Nætter).
Gilleleje Flak N. Fyrskib. I. S. Ibsen, Fører (30 fra 14 Nætter).
Nakkehoved Fyr. V. Eir, Fyrmester (1 fra 1 Nat).
Drogden Fyrskib. Jul. S. Jensen, Fører (2 fra 2 Nætter).
Stevns Fyr. H. Roed, Fyrmester (29 fra 8 Nætter).
Sprogø Fyr. E. Haubirk, Fyrmester (14 fra 5 Nætter).
Omø Fyr. G. A. Petersen, Fyrmester (36 fra 13 Nætter).
Vejrø Fyr. E. M. Hansen, Fyrmester (1 fra 1 Nat).
Hov Fyr. J. L. A. Dahl, Fyrmester (1 fra 1 Nat).
Kjels Nor Fyr. J. Chr. Ryder, Fyrmester (112 fra 21 Nætter).
Helnæs Fyr. S. P. Mortensen, Fyrmester (2 fra 1 Nat).
Skjoldnæs Fyr. H. V. Würtz, Fyrmester (37 fra 15 Nætter).
Christiansø Fyr. H. M. Hansen, Fyrassistent (101 fra 4 Nætter).
Svaneke Fyr. N. P. Johansen, Fyrmester (28 fra 3 Nætter).
Hammeren Fyr. A. M. Dam, Fyrmester (3 fra 2 Nætter).
Dueodde Fyr. C. Liisberg-Poulsen, Fyrmester (90 fra 24 Nætter).
Møen Fyr. A. P. Eliassen, Fyrmester (5 fra 4 Nætter).
Gedser Fyr. C. Madsen, Fyrmester (6 fra 1 Nat).
Gedser Rev Fyrskib. K. G. T. Hald, Fører (106 fra 10 Nætter).
Hyllekrog Fyr. G. U. M. Petersen, Fyrmester (7 fra 3 Nætter).

De Fugle, der indkom til Zoologisk Museum som faldne i 1923, vare:

1. *Anas crecca* L. 3.
2. *Anas penelops* L. 1.

3. *Fuligula cristata* (Ray) 3.
4. *Fuligula marila* (L.) 2.
5. *Somateria mollissima* (L.) 1.
6. *Anser torquatus* Frisch 1.
7. *Podicipes griseigena* (Bodd.) 1.
8. *Podicipes nigricollis* Brehm 3.
9. *Procellaria leucorrhoa* Vieillot 1.
10. *Rallus aquaticus* L. 6.
11. *Gallinula chloropus* (L.) 5.
12. *Fulica atra* L. 2.
13. *Vanellus cristatus* Wolf. & M. 4 (5 faldt).
14. *Numenius arquatus* (L.) 3.
15. *Limosa lapponica* (L.) 1.
16. *Actitis hypoleuca* (L.) 1.
17. *Tringa canutus* L. 5.
18. *Tringa maritima* Brünn. 1.
19. *Tringa alpina* L. 14.
20. *Limnocryptes gallinula* (L.) 34 (39 faldt).
21. *Gallinago scolopacina* Bp. 5.
22. *Scolopax rusticula* L. 10.
23. *Sterna cantiaca* Gml. 1.
24. *Uria troile* (L.) 1.
25. *Botaurus stellaris* (L.) 1.
26. *Falco tinnunculus* L. 1.
27. *Columba palumbus* L. 1.
28. *Cypselus apus* (L.) 5.
29. *Cuculus canorus* L. 1.
30. *Iynx torquilla* L. 5.
31. *Corvus cornix* L. 1.
32. *Corvus frugilegus* L. 1.
33. *Alauda arborea* L. 2.
34. *Alauda arvensis* L. 334 (419 faldt).
35. *Alauda alpestris* L. 1.
36. *Sturnus vulgaris* L. 538 (857 faldt).
37. *Troglodytes parvulus* Koch 6.
38. *Cinclus aquaticus* Bechst. 1.
39. *Sylvia cinerea* Bechst. 7.
40. *Sylvia curruca* (L.) 1.

41. *Sylvia atricapilla* (L.) 3.
42. *Sylvia hortensis* Bechst. 20.
43. *Acrocephalus arundinaceus* (Lightf.) 1.
44. *Acrocephalus phragmitis* (Bechst.) 6.
45. *Acrocephalus aquaticus* (L.) 1.
46. *Locustella fluviatilis* (Wolf) 1.
47. *Locustella nævia* (Bodd.) 1.
48. *Phyllopseustes trochilus* (L.) 28.
49. *Phyllopseustes rufus* (Lath.) 4.
50. *Regulus cristatus* Koch 11.
51. *Anthus pratensis* (L.) 18.
52. *Anthus obscurus* (Lath.) 2.
53. *Anthus arboreus* (Gml.) 5.
54. *Turdus iliacus* L. 537 (882 faldt).
55. *Turdus musicus* L. 340 (475 faldt).
56. *Turdus viscivorus* L. 1.
57. *Turdus pilaris* L. 37 (41 faldt).
58. *Turdus torquatus* L. 6.
59. *Turdus merula* L. 47 (55 faldt).
60. *Saxicola oenanthe* (L.) 36.
61. *Praticola rubetra* (L.) 3.
62. *Ruticilla phoenicura* (L.) 53.
63. *Erithacus rubecula* (L.) 106.
64. *Muscicapa atricapilla* L. 41.
65. *Passer montanus* (L.) 1.
66. *Fringilla coelebs* L. 27.
67. *Fringilla montifringilla* L. 44.
68. *Cannabina linota* Degl. 6.
69. *Cannabina linaria* (L.) 1.
70. *Emberiza schoeniclus* L. 9.
71. *Emberiza lapponica* (L.) 1.
72. *Emberiza nivalis* L. 2.

Af de faldne Arter vare 2, nemlig *Sterna cantiaca* og *Locustella fluviatilis,* ikke faldne ved Fyrene i de foregaaende 37 Aar. Tallet paa de Arter, der ere faldne i Løbet af de sidste 38 Aar, er dermed naaet op til 181.

Fortegnelse over de Fugle, der ere indsendte fra Fyrene som faldne om Natten.

(Hver Nat henregnes til den følgende Dag).

1. *Anas crecca.* Krikand.
Oktober: *4de* Horns Rev 1 ♀. *21de* Stevns 1 ♀ jun. *29de* Lyngvig 1 ♀ jun.

2. *Anas penelops.* Pibeand.
Oktober: *11te* Hesselø 1 ♀.

3. *Fuligula cristata.* Troldand.
Oktober: *21de* Omø 3 (1 ♂ ad., 2 ♂ jun.).

4. *Fuligula marila.* Bjergand.
Oktober: *29de* Hirtshals 2 (1 ♂, 1 ♀).

5. *Somateria mollissima.* Ederfugl.
December: *8de* Omø 1 ♂ ad.

6. *Anser torquatus.* Ringgaas.
Juni: *20de* Hesselø 1.

7. *Podicipes griseigena.* Graastrubet Lappedykker.
December: *3dje* Gedser Rev 1 ♀ ad.

8. *Podicipes nigricollis.* Sorthalset Lappedykker.
Maj: *10de* Vestborg 3 (2 ♂, 1 ♀).

9. *Procellaria leuchorrhoa.* Stor Søsvale.
November: *8de* Vejrø 1 ♂.

10. *Rallus aquaticus.* Vandrikse.
April: *14de* Hesselø 1 ♂.
Oktober: *29de* Lyngvig 1 ♂.
November: *2den* Hesselø 1 ♀ jun. *8de* Bovbjerg 2 ♂. *14de* Blaavands Huk 1 ♀ jun.

11. *Gallinula chloropus.* Rørhøne.
Marts: *25de* Hals Barre 1 ♀.
November: *2den* Blaavands Huk 1 jun. *25de* Stevns 1 ♀ jun.
December: *10de* Kjels Nor 1 ♀ jun. *14de* Sprogø 1 ♀ jun.

12. *Fulica atra.* Blishøne.
November: *13de* Østre Flak 1 ad.
December: *15de* Kjels Nor 1.

13. *Vanellus cristatus.* Vibe.
Marts: *6te* Graadyb 1 ♂. *14de* Hanstholm 1. *16de* Lodbjerg 1 ♀. *25de* Hesselø 1 ♀.
April: *11te* Hesselø 1 ♀.

14. *Numenius arquatus.* Storspove.
April: *14de* Skagen 1, Anholt 1.
September: *16de* Skjoldnæs 1♂.

15. *Limosa lapponica.* Kobbersneppe.
September: *16de* Lodbjerg 1.

16. *Actitis hypoleuca.* Mudderklire.
Maj: *27de* Vestborg 1♀.

17. *Tringa canutus.* Islandsk Ryle.
August: *9de* Kjels Nor 1♂ad.
September: *6te* Blaavands Huk 1♂jun., Lyngvig 1♂jun. *7de* Hanstholm 1♂jun. *8de* Blaavands Huk 1♀jun.

18. *Tringa maritima.* Sortgraa Ryle.
December: *7de* Dueodde 1♂.

19. *Tringa alpina.* Ryle.
Marts: *1ste* Horns Rev 1♂. *14de* Vyl 1♂.
August: *18de* Skjoldnæs 1♂ad. *19de* Blaavands Huk 2 (1♂ jun., 1♀ad.).
September: *7de* Hanstholm 1♂jun. *16de* Lodbjerg 1. *22de* Omø 1♀jun.
Oktober: *4de* Lyngvig 1♀jun. *12te* Anholt 1. *13de* Lodbjerg 2 (1♀ad, 1♀jun.), Skjoldnæs 1♂. *19de* Stevns 1♂jun.

20. *Limnocryptes gallinula.* Enkelt Bekkasin.
April: *15de* Skagen 1♂.
September: *15de* Lodbjerg 1. *16de* Lyngvig 1♂.
Oktober: *4de* Horns Rev 1, Lyngvig 3 (2♂, 1♀jun.). *7de* Hirtsholm 1♂, Anholt 2♂, Sejrø 1. *8de* Hesselø 3♂(8 faldt)[1]). *9de* Anholt 2 (1♂, 1♀jun.). *10de* Vyl 1♀ jun., Kjels Nor 1♀ad. *13de* Lodbjerg 1♂, Omø 1♀ ad. *19de* Hesselø 1♂. *21de* Stevns 1♀ad., Sprogø 1♀ad. *29de* Blaavands Huk 1♂, Vyl 1♂, Lyngvig 3♂.
November: *2den* Blaavands Huk 1♂. *9de* Vyl 1♂, Dueodde 1♀ jun. *10de* Dueodde 1♂. *12te* Dueodde 1♀jun.
December: *4de* Vyl 1♂.

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1) I Klammer er, efter Fyrmestrenes Oplysninger, vedføjet Tallet paa de faldne Fugle, naar dette er et andet end Tallet paa de indsendte; paa samme Maade anføres efter Fyrmestrenes Oplysninger Stære og Viber, selv om intet er indsendt.

21. *Gallinago scolopacina.* Horsegøg.
September: *15de* Lodbjerg 1.
Oktober: *8de* Hesselø 1 ♀ ad. *29de* Lyngvig 1 ♂.
November: *2den* Blaavands Huk 1 ♀ ad., Horns Rev 1.
22. *Scolopax rusticula.* Skovsneppe.
Marts: *20de* Omø 1 ♂.
Oktober: *28de* Graadyb 1 ♂.
November: *2den* Bovbjerg 2, Omø 1 ♀ jun. *8de* Bovbjerg 3, Dueodde 1 ♀ jun. *9de* Gedser Rev 1 ♂.
23. *Sterna cantiaca.* Splitterne.
August: *22de* Hirtsholmene 2 ♂ jun.
24. *Uria troile.* Lomvie.
December: *17de* Anholt Knob 1.
25. *Botaurus stellaris.* Rørdrum.
December: *10de* Drogden 1 ♀ jun.
26. *Falco tinnunculus.* Taarnfalk.
Juli: *31te* Vyl 1 ♀ jun.
27. *Columba palumbus.* Ringdue.
April: *12te* Hesselø 1.
28. *Cypselus apus.* Mursejler.
August: *7de* Schultz's Grund 1. *26de* Hammeren 1 ♀ jun.
September: *27de* Vestborg 1 ♀ ad. *28de* Møen 1 ♂.
Oktober: *4de* Hov 1 ♂.
29. *Cuculus canorus.* Gøg.
September: *9de* Dueodde 1 ♀ jun.
30. *Iynx torquilla.* Vendehals.
Maj: *5te* Anholt 3 ♂.
September: *15de* Lyngvig 2 (1 ♂, 1 ♀ jun.).
31. *Corvus cornix.* Krage.
Marts: *29de* Vyl 1 ♂.
32. *Corvus frugilegus.* Raage.
November: *1ste* Graadyb 1 ♀ jun.
33. *Alauda arborea.* Hedelærke.
Marts: *26de* Læsø Trindel 1 ♂, Stevns 1 ♂.
34. *Alauda arvensis.* Lærke.
Januar: *25de* Vyl 1 ♂. *26de* Schultz's Grund 1 ♂.
Februar: *23de* Horns Rev 2 (1 ♂, 1 ♀ ad.). *24de* Vyl 1 ♂. *26de* Vyl 1 ♀ ad. *27de* Graadyb 4 (2 ♂, 1 ♀ ad., 1 ♀

jun.), Vyl 1 ♀ ad., Horns Rev 1 ♀ ad. *28de* Horns Rev 1 ♀ ad.

Marts: *1ste* Blaavands Huk 1 ♀ jun., Horns Rev 5 (2 ♂, 3 ♀ ad.). *2den* Vyl 1 ♂, Læsø Trindel 1 ♂. *4de* Vyl 1 ♀ jun. *5te* Graadyb 3 (1 ♂, 2 ♀ ad.), Vyl 2 (1 ♂, 1 ♀ jun.). *12te* Vyl 2 ♀, Schultz's Grund 1 ♂. *13de* Schultz's Grund 1 ♂. *14de* Schultz's Grund 1 ♂. *15de* Horns Rev 3 ♀ ad., Østre Flak 10 (6 ♂, 3 ♀ ad., 1 ♀ jun.), Anholt Knob 7 (5 ♂, 1 ♀ ad., 1 ♀ jun.), Schultz's Grund 3 (1 ♂, 2 ♀ jun.), Hesselø 6 (3 ♂, 3 ♀ ad.), Dueodde 1 ♂. *16de* Vyl 1 ♂ (2 faldt), Lodbjerg 1 ♂. *22de* Vyl 1 ♀ jun. *25de* Hals Barre 1 ♀ ad. *26de* Læsø Trindel 6 ♀ ad., Anholt 11 ♀, Hesselø 3 ♀, Stevns 2 ♀.

April: *11te* Omø 3 ♀. *12te* Hirtsholmene 2 ♀, Østre Flak 1 ♀, Hesselø 2 ♀. *13de* Anholt 2 ♀. *14de* Dueodde 1 ♀ ad. *18de* Vyl 1 ♀.

Oktober: *2den* Lyngvig 4 (3 ♀ ad., 1 ♀ jun.). *7de* Skjoldnæs 1 ♀ jun. *8de* Hesselø 5 (3 ♂, 1 ♀ ad., 1 ♀ jun.), Hyllekrog 1 ♀ jun. *9de* Anholt 1 ♂. *12te* Anholt Knob 1 ♂. *13de* Omø 1 ♀ jun. *15de* Skjoldnæs 1 ♀ jun. *18de* Christiansø 12 (4 ♂, 3 ♀ ad., 5 ♀ jun.), Dueodde 2 (1 ♂, 1 ♀ jun.). *19de* Vyl 1 ♀ jun., Østre Flak 1 ♂, Hesselø 2 ♀ jun. (35 faldt), Schultz's Grund 16 (12 ♂, 4 ♀), Hjelm 4 (3 ♂, 1 ♀ jun.), Sejrø 6 (4 ♂, 2 ♀ ad.), Vestborg 1 ♀, Dueodde 4 (2 ♂, 2 ♀ ad.), Gedser Rev 1 ♀ jun., Hyllekrog 1 ♀ jun. *20de* Christiansø 2 (1 ♂, 1 ♀ jun.), Dueodde 1 ♀ ad., Svaneke 3 (1 ♂, 2 ♀ jun.). *21de* Graadyb 6 (5 ♀ ad., 1 ♀ jun.), Blaavands Huk 2 ♂, Vyl 2 (1 ♂, 1 ♀ jun.),Horns Rev 7 (2 ♂, 2 ♀ ad., 3 ♀ jun.), Lyngvig 6 (2 ♂, 4 ♀), Hesselø 4 (3 ♂, 1 ♀ ad.). *22de* Vyl 1 ♀ jun. *28de* Graadyb 7 (2 ♂, 2 ♀ ad., 3 ♀ jun.). *29de* Blaavands Huk 2, Horns Rev 5 (4 ♂, 1 ♀ jun.), Vyl 1 ♂ (5 faldt), Lyngvig 2 (1 ♀ ad., 1 ♀ jun.).

November: *1ste* Graadyb 3 (1 ♂, 1 ♀ ad., 1 ♀ jun.; 5 faldt), Hjelm 5 (3 ♂, 2 ♀ ad.), Vestborg 1 ♀ jun. *2den* Blaavands Huk 4, Vyl 3 (2 ♂, 1 ♀), Horns Rev 1 ♀ ad., Bovbjerg 4, Hanstholm 7 (4 ♂, 3 ♀ ad.), Østre Flak 2 ♂, Anholt 22 (15 ♂, 2 ♀ ad., 5 ♀ jun.), Hesselø 6 ♂ (29

faldt), Sejrø 1 ♀ ad., Stevns 1 ♀ jun., Omø 1 ♂, Kjels Nor 1 ♂, Gedser Rev 5 (3 ♀ ad., 2 ♀ jun.). *3dje* Skagen 1 ♀ jun., Hals Barre 1 ♂. *6te* Lyngvig 3 (1 ♂, 1 ♀ ad., 1 ♀ jun). *7de* Vyl 2 ♀ ad. (6 faldt). *8de* Vyl 2 ♂, Sprogø 3 (2 ♂, 1 ♀ ad.), Kjels Nor 4 (2 ♂, 2 ♀ jun.). *9de* Graadyb 2 ♂, Vyl 4 (2 ♂, 1 ♀ ad., 1 ♀ jun.; 22 faldt), Stevns 3 ♂, Kjels Nor 1 ♀ jun., Skjoldnæs 2 ♂, Gedser Rev 15 (7 ♂, 8 ♀ jun.). *10de* Vyl 1 ♂. *11te* Vyl 1 ♂. *12te* Kjels Nor 1 ♂.

December: *11te* Gilleleje Flak 1 ♂. *12te* Helnæs 2 (1 ♂, 1 ♀). *13de* Vyl 1 ♂.

35. *Alauda alpestris.* Bjerglærke.

Oktober: *5te* Horns Rev 1 ♂.

36. *Sturnus vulgaris.* Stær.

Februar: *18de* (Horns Rev 1). *23de* Horns Rev 1 ♀ ad.

Marts: *1ste* Horns Rev 2 (1 ♂, 1 ♀ ad.). *5te* Graadyb 1 ♂. *6te* Horns Rev 3 (1 ♂, 2 ♀ ad.). *7de* Dueodde 1. *12te* Graadyb 2 (1 ♂ ad., 1 ♂ jun.). *13de* Vyl 1 ♀, Horns Rev 3 (1 ♂, 2 ♀). *14de* Vyl 1 ♀ (8 faldt). *15de* Graadyb 1 ♂ ad., Vyl 1 ♂ (10 faldt), (Kjels Nor 1). *16de* Vyl 1 ♂ (5 faldt), Horns Rev 2 ♀ jun. *17de* Vyl 1 ♂. *18de* Vyl 1 ♂. *22de* Vyl 1 ♂ (14 faldt). *23de* Vyl 2 (1 ♂, 1 ♀; 5 faldt). *24de* Vyl 1 ♂ (2 faldt). *25de* Vyl 2 (1 ♀ ad., 1 ♀ jun.; 13 faldt), Horns Rev 5 (3 ♂ ad., 1 ♂ jun., 1 ♀ ad.), Hals Barre 1 ♂. *26de* Graadyb 1 ♂ jun., Vyl 2 (1 ♀ ad., 1 ♀ jun.), Horns Rev 3 (2 ♂, 1 ♀ jun.), Læsø Trindel 2 (1 ♂, 1 ♀ jun.). *27de* Vyl 1 ♀ ad., Horns Rev 1 ♀ jun. *30te* Vyl 1 ♀ jun.

April: *11te* (Sejrø 1), Gilleleje Flak 1 ♀, (Kjels Nor 2). *12te* (Skagen 3), Hesselø 4 (1 ♂, 2 ♀ ad., 1 ♀ jun.). *13de* Graadyb 1 ♀, Horns Rev 2 ♂. *14de* Læsø Trindel 1 ♀, Anholt 4, Hesselø 1 ♀, (Nakkehoved 1), Gilleleje Flak 1 ♀, Stevns 3 (1 ♀ ad., 2 ♀ jun.), Dueodde 2 ♀, Møen 1 ♀ jun. *15de* Graadyb 2 ♀, Horns Rev 1 ♂, (Sejrø 2). *16de* Anholt 1 ♀ jun. *19de* Horns Rev 2 (1 ♂, 1 ♀).

Oktober: *2den* Lyngvig 95 (39 ♂, 32 ♀ ad., 24 ♀ jun.). *19de* Læsø Rende 1 ♀ jun., Vestborg 3 (1 ♂, 2 ♀ jun.), Dueodde 1 ♂ jun. *20de* Omø 1 ♀ ad., Christiansø 31 (16 ♂,

7 ♀ ad., 7 ♀ jun.; ca. 100 faldt), Hammeren 2 (1 ♀ ad., 1 ♀ jun.; 8 faldt), Dueodde 21 (8 ♂ ad., 1 ♂ jun., 10 ♀ ad., 2 ♀ jun.), Svaneke 12. *21de* Graadyb 1 ♀ jun., Lyngvig 1 ♀, Kjels Nor 1 ♂ ad. *27de* Blaavands Huk 3 (1 ♂ jun., 2 ♀ jun.). *28de* Graadyb 7 (2 ♂, 2 ♀ ad., 2 ♀ jun.), Hirtshals 1. *29de* Blaavands Huk 46 (14 ♂, 23 ♀ ad., 9 ♀ jun.), Vyl 1 ♂, Horns Rev 1 ♀ ad., Lyngvig 14 (5 ♂, 8 ♀ ad., 1 ♀ jun.), Østre Flak 1 ♀ jun., Hjelm 1 ♂. *30te* Graadyb 1 ♂.

November: *1ste* Graadyb 3 (2 ♀ ad., 1 ♀ jun.; 34 faldt), Hjelm 1 ♂. *2den* Blaavands Huk 167 (20 ♂, 26 ♀ ad., 10 ♀ jun.), Vyl 3 ♀ ad. (70 faldt), Horns Rev 2 (1 ♀ ad., 1 ♀ jun.; 56 faldt), Bovbjerg 4, Hanstholm 4 (3 ♂, 1 ♀ jun.), Skagen 3, (Læsø Rende 3), Østre Flak 1 ♀ jun., Anholt Knob 1 ♂, Hesselø 2 ♂, Schultz's Grund 2 (1 ♂, 1 ♀ jun.), Kjels Nor 4 ♂. *3dje* Vyl 1 ♀ ad. (14 faldt). *4de* Vyl 1 ♂ (5 faldt). *5te* Vyl 1 ♂ (3 faldt). *6te* Lyngvig 1 ♀ jun. *7de* Horns Rev 1 ♂. *8de* Blaavands Huk 6 (1 ♂, 5 ♀ ad.), Bovbjerg 1 ♂, Sprogø 1 ♀ ad. *9de* Blaavands Huk 2 (1 ♂, 1 ♀ ad.), Vyl 1 ♀ jun. (12 faldt), Horns Rev 1 ♂, *11te* Blaavands Huk 5 (3 ♂, 2 ♀ ad.). *12te* Kjels Nor 1 ♀ jun. *22de* Vyl 1 ♂ jun.

December: *7de* Lyngvig 1 ♂ jun., Nakkehoved 1 ♂. *25de* Sprogø 1 ♀.

37. *Troglodytes parvulus.* Gærdesmutte.

April: *13de* Schultz's Grund 1 ♂. *21de* Schultz's Grud 1 ♂.

Oktober: *19de* Stevns 1 ♀ ad.

November: *9de* Gedser Rev 2. *13de* Møen 1 ♂.

38. *Cinclus aquaticus.* Vandstær.

November: *2den* Anholt 1 ♀ jun.

39. *Sylvia cinerea.* Tornsanger.

Maj: *7de* Læsø Trindel 1 ♀ jun. *26de* Vyl 1.

August: *30te* Gedser Rev 1 ♀ ad.

September: *7de* Hanstholm 1 ♂. *16de* Lyngvig 1 ♀ jun., Skjoldnæs 1 ♂, Gedser 1 ♂.

40. *Sylvia curruca.* Gærdesanger.

September: *22de* Dueodde 1 ♀ ad.

41. *Sylvia atricapilla.* Munkesanger.

September: *16de* Skjoldnæs 1 ♂.

Oktober: *4de* Graadyb 1 ♀. *12te* Anholt 1 ♀.

42. *Sylvia hortensis.* Havesanger.
August: *30te* Gedser Rev 1♂.
September: *14de* Lyngvig 4 (2♂, 2♀ jun.), Skjoldnæs 1♀ jun. *15de* Lyngvig 7 (1♂, 6♀ jun.). *16de* Gedser 1. *17de* Blaavands Huk 1. *19de* Dueodde 1.
Oktober: *2den* Blaavands Huk 1♂. *4de* Blaavands Huk 1♂, Omø 1♂. *21de* Blaavands Huk 1♂.

43. *Acrocephalus arundinaceus.* Rørsanger.
Maj: *28de* Vestborg 1♂.

44. *Acrocephalus phragmitis.* Sivsanger.
Maj: *5te* Dueodde 1♂. *7de* Vestborg 1♂. *10de* Vestborg 1♂. *24de* Vyl 1.
September: *15de* Lyngvig 1♂.
Oktober: *2den* Dueodde 1♀ jun.

45. *Acrocephalus aquaticus.* Vandsanger.
Oktober: *2den* Skjoldnæs 1♂.

46. *Locustella fluviatilis.* Flodsanger.
September: *15de* Lyngvig 1♀ jun.

47. *Locustella nævia.* Græshoppesanger.
September: *15de* Lyngvig 1.

48. *Phyllopseustes trochilus.* Løvsanger.
Maj: *5te* Anholt 4♂. *6te* Vyl 1, Anholt Knob 2♀. *7de* Læsø Trindel 1♂, Vestborg 1♂, Gilleleje Flak 4 (1♂, 1♀ ad., 2♀ jun.). *8de* Schultz's Grund 1♂. *27de* Vyl 1.
August: *30te* Gedser Rev 3 (2♂ jun., 1♀ jun.).
September: *7de* Hanstholm 2♂ jun. *14de* Lyngvig 1♂ jun., Skjoldnæs 1, Gedser Rev 4. *15de* Kjels Nor 1♂. *23de* Kjels Nor 1♂ jun.

49. *Phyllopseustes rufus.* Gransanger.
April: *13de* Vyl 1♂.
Oktober: *4de* Lyngvig 1♂. *19de* Omø 1♀ ad.
November: *2den* Gedser Rev 1♂.

50. *Regulus cristatus.* Fuglekonge.
Oktober: *4de* Omø 1♀. *15de* Dueodde 2♂. *21de* Schultz's Grund 1♂.
November: *7de* Gedser Rev 1♂. *9de* Gedser Rev 6 (2♂, 2♀).

51. *Anthus pratensis.* Engpiber.
Marts: *14de* Vyl 1, Horns Rev 2 (1♂, 1♀ ad.).

1923)

April: *13de* Vyl 1 ♂. *14de* Vyl 1 ♀ ad. *15de* Horns Rev 2 ♂. *16de* Vyl 1 ♀ jun.

September: *27de* Anholt Knob 1, Schultz's Grund 1. *28de* Læsø Trindel 1.

Oktober: *1ste* Schultz's Grund 4. *21de* Blaavands Huk 1 ♂.

November: *1ste* Graadyb 1 ♂. *6te* Kjels Nor 1 ♂.

52. *Anthus obscurus.* Skærpiber.

Oktober: *4de* Graadyb 1. *5te* Horns Rev 1.

53. *Anthus arboreus.* Træpiber.

September: *15de* Lyngvig 2 ♀ jun. *18de* Graadyb 1 ♂. *22de* Omø 1 ♂. *26de* Graadyb 1.

54. *Turdus iliacus.* Vindrossel.

April: *12te* Østre Flak 1 ♀, Hesselø 4 (3 ♂, 1 ♀ jun.). *14de* Anholt 4 (c. 40 faldt), Hesselø 8 (5 ♂, 1 ♀ ad., 2 ♀ jun.; c. 65 faldt), Schultz's Grund 1 ♀ ad., Gilleleje Flak 1 ♀, Stevns 3 ♂, Christiansø 2 ♀, Dueodde 14 (9 ♂, 5 ♀), Møen 1 ♀ jun. *15de* Skagen 1 ♀ jun., Læsø Trindel 1 ♂, Schultz's Grund 1 ♂, Hesselø 2 (1 ♂, 1 ♀ jun.; c. 8 faldt), Dueodde 2 ♀ jun. *16de* Horns Rev 1 ♀ jun.

Oktober: *2den* Lyngvig 8 (1 ♂ ad., 1 ♂ jun., 4 ♀ ad., 2 ♀ jun.). *4de* Blaavands Huk 2 (1 ♀ ad., 1 ♀ jun.), Vyl 1 ♂, Horns Rev 1, Lyngvig 4. *5te* Dueodde 1 ♀ ad. *7de* Anholt 3, Hyllekrog 1 ♂. *8de* Vyl 1 ♂. *9de* Blaavands Huk 1 ♂, Horns Rev 1 ♂. *10de* Vyl 1 ♀ ad. *11te* Skagen 5, Østre Flak 1 ♂, Anholt Knob 3 (1 ♂, 2 ♀ jun.), Hesselø 3 (1 ♂, 2 ♀ jun.; 6 faldt). *12te* Anholt 25 (c. 120 faldt). *13de* Vyl 2 (1 ♀ ad., 1 ♀ jun.), Lodbjerg 1 ♀ jun., Omø 4 (3 ♂, 1 ♀ jun.), Kjels Nor 4 (2 ♂, 1 ♀ ad., 1 ♀ jun.), Skjoldnæs 5 (3 ♂, 1 ♀ ad., 1 ♀ jun.), Svaneke 3 (1 ♂, 1 ♀ ad., 1 ♀ jun.). *14de* Vyl 1 ♀ jun. *15de* Blaavands Huk 1 ♀ jun., Hirtshals 1 ♀ jun., Omø 1 ♂, Kjels Nor 1, Skjoldnæs 1 ♀ ad. *16de* Blaavands Huk 1 ♀ ad. *17de* Hesselø 3 ♂ (10 faldt), Gilleleje Flak 1 ♂, Kjels Nor 1, Dueodde 1 ♀ ad. *18de* Christiansø 3, Svaneke 2 ♀ ad. *19de* Lyngvig 3, Rubjerg Knude 4 (7 faldt), Hesselø 6 (5 ♂, 1 ♀ ad.; 102 faldt), Schultz's Grund 9, Hjelm 33 (21 ♂, 4 ♀ ad., 8 ♀ jun.), Sejrø 22 (11 ♂, 3 ♀ ad., 8 ♀ jun.), Vestborg 7 (5 ♂, 2 ♀

jun.), Sprogø 1♂, Omø 2♂, Kjels Nor 4 (3♂, 1♀jun.), Dueodde 2 (1♂, 1♀jun.), Hyllekrog 2 (1♂, 1♀ad.). *20de* Omø 1♀jun., Kjels Nor 1♀ad. *21de* Blaavands Huk 18, Lyngvig 7, Hesselø 2 (1♂, 1♀jun.), Hjelm 3♀jun., Stevns 1♂, Sprogø 4 (1♂, 1♀ad., 2♀jun.), Kjels Nor 2 (1♂, 1♀jun.). *28de* Graadyb 4 (1♂ad., 1♂jun., 1♀ad., 1♀jun.), Omø 1♀jun. *29de* Blaavands Huk 107, Vyl 1♀ad. (5 faldt), Horns Rev 1♀ad., Lyngvig 97 (20♂ad., 26♂jun., 15♀ad., 36♀jun.), Lodbjerg 1♀ad., Østre Flak 1♀ad.

November: *1ste* Graadyb 2 (1♂jun., 1♀jun.; 4 faldt), Hjelm 3 (2♂ad., 1♂jun.). *2den* Blaavands Huk 27, Vyl 1♂ jun., Horns Rev 1 (6 faldt), Bovbjerg 4, Skagen 6, Schultz's Grund 1♀jun., Hesselø 3 (1♀ad., 2♀jun.; 34 faldt), Sejrø 3 (1♀ad., 2♂jun.), Stevns 1♀jun., Kjels Nor 39 (3♂ad., 16♂jun., 1♀ad., 19♀jun.), Gedser Rev 16. *3dje* Horns Rev 1♀ad., Lyngvig 10 (1♂ad., 1♂ jun., 4♀ad., 4♀jun.), Skagen 4 (2♂jun., 2♀jun.). *6te* Lyngvig 6 (2♂, 2♀ad., 2♀jun.), Kjels Nor 4 (2♂ad., 2♀jun.). *8de* Blaavands Huk 8 (2♀ad., 2♂jun., 4♀ jun.), Kjels Nor 2 (1♂, 1♀jun.). *9de* Blaavands Huk 1♀jun., Vyl 1♂ad.

55. *Turdus musicus.* Sangdrossel.

Marts: *26de* Stevns 1♂ad.

April: *10de* Gilleleje Flak 1♂jun. *11te* Hesselø 3 (2♂ad., 1♂jun.), Gilleleje Flak 1♂ad. *12te* Schultz's Grund 1♂jun. *13de* Horns Rev 5 (3♂ad., 1♂jun., 1♀jun.), Hirtsholmen 2 (1♂, 1♀; 7 faldt). *14de* Læsø Trindel 5♂ad., Læsø Rende 3, Anholt Knob 2♂, Anholt 3 (c. 40 faldt), Hesselø 2 (1♀ad., 1♀jun.; c. 15 faldt), Gilleleje Flak 2 (1♂, 1♀), Stevns 1♀, Egense Bagfyr 7 (4♂, 3♀), Dueodde 6 (4♂, 2♀). *15de* Vyl 1♂ad, Læsø Trindel 4 (2♂ad., 1♂jun., 1♀jun.), Læsø Rende 1♀ad., Anholt Knob 1♀jun., Hesselø 3 (1♂, 1♀ad., 1♀jun.; 8 faldt), Schultz's Grund 3 (1♂jun., 2♀ad.; 7 faldt), Gilleleje Flak 3 (1♂, 2♀), Dueodde 1♀ad. *18de* Vyl 1♀jun. *24de* Gilleleje Flak 1♀ad. *26de* Vyl 1, Gilleleje Flak 1♂ad. *30te* Vyl 1♀jun.

Maj: *5te* Anholt 15, Dueodde 1 ♀ jun. *6te* Anholt Knob 1.
September: *30te* Skjoldnæs 1 ♀ jun.
Oktober: *3dje* Lyngvig 1 ♂ ad. *4de* Blaavands Huk 4 (1 ♂ ad., 3 ♀ jun.), Vyl 1 ♀ jun., Horns Rev 2, Lyngvig 22 (3 ♂ ad., 5 ♂ jun., 6 ♀ ad., 3 ♀ jun.), Skjoldnæs 3 (2 ♂ ad., 1 ♂ jun.), Kjels Nor 1. *5te* Graadyb 1 ♂ jun., Horns Rev 1, Hjelm 1 ♂ jun. *6te* Blaavands Huk 2 (1 ♂ jun., 1 ♀ jun.), Østre Flak 1 ♂ jun., Anholt Knob 1 ♂ ad. *7de* Anholt Knob 1 ♂ ad., Anholt 12, Hesselø 5 (4 ♂ jun., 1 ♀ jun.; 11 faldt), Sejrø 4 (2 ♀ ad., 2 ♀ jun.), Vestborg 2 (1 ♂ jun., 1 ♀ ad.), Møen 1 ♂ ad., Hyllekrog 2 (1 ♂ ad., 1 ♀ ad.). *8de* Vyl 1 ♀ jun., Hesselø 3 (2 ♂ ad., 1 ♀ ad.). *11te* Anholt Knob 1 ♂ jun., Hesselø 1 ♂ jun. (3 faldt.) *12te* Anholt Knob 1 ♂ ad., Anholt 8 (c. 60 faldt). *13de* Stevns 2 ♂ ad., Omø 1 ♂ ad., Kjels Nor 1 ♂ ad., Skjoldnæs 2 (1 ♀ ad., 1 ♀ jun.), Svaneke 6 (3 ♂ ad., 1 ♂ jun., 1 ♀ ad., 1 ♀ jun.). *14de* Vyl 2 (1 ♂ jun., 1 ♀ jun.). *15de* Blaavands Huk 1 ♂ ad., Hirtshals 1 ♂ jun. Gilleleje Flak 1 ♂ ad., Omø 1 ♀ ad., Skjoldnæs 1 ♂ ad. *16de* Gilleleje Flak 1 ♀ jun., Skjoldnæs 1 ♂ ad. *18de* Christiansø 41, Dueodde 2 (1 ♂ ad., 1 ♂ jun.), Svaneke 1 ♀ ad. *19de* Hesselø 2 (1 ♂ ad., 1 ♀ jun.; 6 faldt), Schultz's Grund 1, Hjelm 3 (1 ♂, 1 ♀ ad., 1 ♀ jun.), Sejrø 1 ♀ ad., Vestborg 2 (1 ♂ jun., 1 ♀ jun.), Kjels Nor 1 ♀ jun., Dueodde 2 (1 ♂ ad., 1 ♀ jun.), Gedser Rev 1 ♀ ad. *20de* Christiansø 2 (1 ♂ ad., 1 ♀ jun.). *21de* Graadyb 2 (1 ♂ jun., 1 ♀ jun.), Blaavands Huk 2, Lyngvig 1, Hesselø 3 (2 ♀ ad., 1 ♀ jun.; 4 faldt), Stevns 1 ♀ jun., Sprogø 2 (1 ♂ ad., 1 ♀ ad.). *28de* Graadyb 4 (1 ♂ jun., 3 ♀ jun.). *29de* Blaavands Huk 29, Lyngvig 9 (1 ♂ ad., 1 ♂ jun., 4 ♀ ad., 3 ♀ jun.), Lodbjerg 2 (1 ♂ jun., 1 ♀ jun.), Østre Flak 1 ♀ jun.
November: *1ste* Graadyb 3 (1 ♀ ad., 2 ♀ jun.; 5 faldt), Vyl 1 ♂ jun. *2den* Blaavands Huk 5, Vyl 1 ♀ ad., Schultz's Grund 1 ♂ ad., Hesselø 2 (1 ♂ ad., 1 ♀ ad.; 6 faldt), Kjels Nor 9 (5 ♂ ad., 1 ♂ jun., 1 ♀ ad., 2 ♀ jun.), Gedser Rev 3. *4de* Vyl 1 ♂ ad. *7de* Vyl 1 ♀ jun.

56. *Turdus viscivorus.* Misteldrossel.

November: *2den* Hesselø 1 ♂.

57. *Turdus pilaris.* Sjagger.

Februar: *11te* Dueodde 1 ♂.
April: *13de* Hirtsholmene 1 ♀ jun. *14de* Anholt 2, Hesselø 2 ♂.
Maj: *5te* Anholt 9.
November: *2den* Hesselø 1 ♀ ad. *6te* Vyl 1 ♂. *8de* Blaavands Huk 1 ♀ ad., Schultz's Grund 1 ♀ ad. *9de* Stevns 1 ♀ ad. *13de* Gedser Rev 1 ♂. *14de* Gilleleje Flak 1 ♀ ad. *19de* Vyl 1 ♂.
December: *2den* Gedser Rev 3 (2 ♂, 1 ♀ jun.), *4de* Hals Barre 1 ♂. *6te* Hesselø 7 (2 ♂, 1 ♀ ad., 4 ♀ jun.; 11 faldt). *7de* Lyngvig 1 ♀ ad., Skjoldnæs 1 ♀ ad. *10de* Schultz's Grund 1 ♂.

58. *Turdus torquatus.* Ringdrossel.

April: *10de* Horns Rev 1 ♂.
Maj: *5te* Anholt 2 ♂.
Oktober: *4de* Blaavands Huk 1 ♀ ad., Horns Rev 1. *13de* Dueodde 1 ♀ jun.

59. *Turdus merula.* Solsort.

Februar: *27de* Graadyb 1 ♂ ad., Vyl 1 ♂ ad.
Marts: *15de* Vyl 1 ♂, Horns Rev 2 ♂. *25de* Vyl 1 ♀. Hesselø 1 ♂. *26de* Læsø Trindel 2 ♂.
April: *12te* Læsø Rende 1 ♀ jun. *14de* Læsø Trindel 1 ♀ jun., Hesselø 2 ♀ jun. *15de* Hesselø 2 ♀ jun.
Oktober: *21de* Blaavands Huk 3 (2 ♂ ad., 1 ♀ jun.). *22de* Graadyb 1 ♂. *29de* Blaavands Huk 1 ♀ jun.
November: *1ste* Graadyb 2 (1 ♂, 1 ♀ ad.; 4 faldt). *2den* Vyl 2 (1 ♀ ad., 1 ♀ jun.), Horns Rev 4 (1 ♂, 3 ♀), Bovbjerg 1 ♀, Østre Flak 1 ♂, Hesselø 2 (1 ♂ ad., 1 ♂ jun.), Sejrø 1 ♀ ad. *7de* Vyl 2 (1 ♂ jun., 1 ♀ jun.). *8de* Blaavands Huk 1 ♂ jun., Bovbjerg 8 (2 ♂ ad., 2 ♂ jun., 3 ♀ ad., 1 ♀ jun.). *9de* Graadyb 1 ♂ ad., Vyl 2 (1 ♂ ad., 1 ♀ ad.; 8 faldt).

60. *Saxicola oenanthe.* Stenpikker.

April: *12te* Læsø Rende 2 ♂, Østre Flak 2 (1 ♂, 1 ♀). *13de* Hirtsholmene 1 ♂, Anholt 3 (2 ♂, 1 ♀), Gilleleje Flak 1 ♂. *14de* Læsø Trindel 2 (1 ♀ ad., 1 ♀ jun.), Hesselø

1 ♀ jun., Christiansø 1 ♂. *15de* Horns Rev 1 ♂, Schultz's Grund 3 (2 ♂, 1 ♀ ad.). *16de* Horns Rev 1 ♀. *17de* Vyl 1 ♂.

Maj: *5te* Anholt 1 ♀. *7de* Schultz's Grund 2 ♂.

August: *30te* Gedser Rev 1 ♀ ad.

September: *7de* Hanstholm 1 ♂. *10de* Læsø Rende 1 ♂. *12te* Blaavands Huk 1 ♂. *16de* Graadyb 1 ♀, Skjoldnæs 2 ♂. *21de* Østre Flak 1 ♀ ad. *26de* Kjels Nor 1 ♀ ad. *28de* Blaavands Huk 1 ♂.

Oktober: *4de* Lyngvig 2 (1 ♂ jun., 1 ♀ jun.), Omø 1 ♀ jun. *19de* Dueodde 1 ♂.

61. *Praticola rubetra.* Bynkefugl.

Maj: *5te* Anholt 1 ♂. *7de* Schultz's Grund 1 ♂.

September: *14de* Gedser Rev 1 ♂.

62. *Ruticilla phoenicura.* Rødstjert.

Maj: *5te* Anholt 6 (5 ♂, 1 ♀), Dueodde 2 (1 ♂, 1 ♀). *6te* Anholt Knob 1 ♀. *7de* Gilleleje Flak 3 (2 ♂, 1 ♀). *8de* Schultz's Grund 2 (1 ♂, 1 ♀).

August: *30te* Gedser Rev 3 (1 ♂ ad., 1 ♂ jun., 1 ♀ jun.).

September: *7de* Hanstholm 1 ♀ jun. *11te* Dueodde 1 ♂, *14de* Gedser Rev 7 (1 ♂, 6 ♀ jun.). *15de* Anholt Knob 1 ♀ jun. *16de* Graadyb 1 ♀, Lyngvig 1 ♀ jun., Østre Flak 1 ♀, Schultz's Grund 1 ♂, Kjels Nor 2 (1 ♂, 2 ♀ ad.), Gedser 4 (3 ♂, 1 ♀ jun.). *18de* Graadyb 1 ♂. *23de* Kjels Nor 1 ♀. *29de* Lyngvig 1 ♂.

Oktober: *2den* Schultz's Grund 1 ♀. *4de* Blaavands Huk 2 ♀ jun., Lyngvig 6 (4 ♂, 2 ♀ jun.), Skjoldnæs 1 ♀ jun. *19de* Dueodde 1 ♂. *29de* Blaavands Huk 1 ♀ jun.

November: *2den* Kjels Nor 1 ♀ jun.

63. *Erithacus rubecula.* Rødkælk.

Marts: *14de* Graadyb 1 ♂ jun. *25de* Drogden 1 ♂ jun. *26de* Anholt 2 ♂. *28de* Horns Rev 1 ♂ jun.

April: *12te* Vyl 1, Horns Rev 1 ♂ jun., Anholt Knob 3 ♂, Hesselø 1 ♂ ad. *13de* Vyl 1 ♀ jun., Anholt 3 (2 ♂ ad., 1 ♂ jun.), Hirtsholmene 1 ♂ jun. *14de* Vyl 1 ♂ jun., Hesselø 2 (1 ♂ jun., 1 ♀ jun.), Stevns 1 ♂ jun., Gedser Rev 2 (1 ♂ jun., 1 ♀ jun.). *15de* Læsø Trindel 1 ♂, Anholt Knob 1 ♂ jun., Hesselø 1 ♀ jun., Gilleleje Flak 2 ♂ jun. *16de* Anholt Knob 1 ♂ jun., Schultz's Grund 1 ♂ jun.

September: *17de* Dueodde 1 ♂ jun.

Oktober: *4de* Blaavands Huk 1 ♂ jun., Lyngvig 1 ♂ jun., Omø 3 (2 ♂ jun., 1 ♀ jun.). *6te* Gilleleje Flak 1 ♀ jun. *7de* Anholt 1 ♂ jun. *18de* Dueodde 1 ♀ jun., Christiansø 3 (1 ♂ ad., 1 ♂ jun., 1 ♀ ad.). *19de* Schultz's Grund 1 ♂ jun., Omø 1 ♂ jun., Dueodde 1 ♂ jun. *20de* Christiansø 1 ♂ jun. *21de* Blaavands Huk 1 ♂ jun., Schultz's Grund 4 (1 ♂ ad., 2 ♂ jun., 1 ♀ jun.), Hesselø 2 (1 ♂, 1 ♀ ad.).

November: *1ste* Graadyb 2 (1 ♂, 1 ♀ jun.). *2den* Blaavands Huk 1 ♂ jun., Vyl 3 (2 ♂ jun., 1 ♀ jun.), Hanstholm 1 ♂ jun., Østre Flak 2 ♀ jun., Anholt Knob 2 (1 ♂ jun., 1 ♀ jun.), Anholt 4 (2 ♂ jun., 1 ♀ ad., 1 ♀ jun.), Schultz's Grund 1 ♂ ad., Hesselø 3 (1 ♂ jun., 1 ♀ ad., 1 ♀ jun.), Kjels Nor 10 (2 ♂ ad., 4 ♂ jun., 3 ♀ ad., 1 ♀ jun.), Gedser Rev 10 (3 ♂ jun., 5 ♀ ad., 2 ♀ jun.). *3dje* Omø 1 ♂ jun., Gedser Rev 1 ♂ jun. *7de* Horns Rev 1 ♀ jun., Gedser Rev 1 ♂ ad. *9de* Graadyb 1 ♂ ad., Vyl 1 ♂ jun., Gedser Rev 9 (1 ♂ ad., 5 ♂ jun., 3 ♀ ad.).

64. *Muscicapa atricapilla.* Broget Fluesnapper.

Maj: *7de* Vestborg 2 (1 ♂, 1 ♀ jun.), Gilleleje Flak 1 ♂. *10de* Vestborg 1 ♂.

August: *30te* Gedser Rev 3 (2 ♂ jun., 1 ♀ jun.).

September: *6te* Lyngvig 1 ♂. *7de* Hanstholm 1 ♂. *14de* Gedser Rev 2 ♀ jun. *15de* Lyngvig 14 (5 ♂, 9 ♀ jun.). *16de* Lyngvig 5 ♀ jun. *17de* Blaavands Huk 1. *22de* Kjels Nor 1 ♀ ad. *23de* Kjels Nor 1 ♀ ad. *26de* Blaavands Huk 1 ♀ jun. *28de* Blaavands Huk 1 ♀ jun. *29de* Blaavands Huk 1 ♂, Lyngvig 2 ♀.

Oktober: *3dje* Lyngvig 1 ♂. *4de* Blaavands Huk 2 (1 ♂, 1 ♀ jun.).

65. *Passer montanus.* Skovspurv.

April: *21de* Horns Rev 1 ♀ jun.

66. *Fringilla coelebs.* Bogfinke.

Marts: *28de* Graadyb 2 (1 ♂, 1 ♀). *29de* Horns Rev 1 ♀.

April: *1ste* Vyl 1 ♀. *2den* Vyl 1. *13de* Vyl 1 ♀, Horns Rev 2 (1 ♂, 1 ♀). *14de* Anholt Knob 1 ♀. *15de* Vyl 1 ♀. *19de* Schultz's Grund 1 ♀. *30te* Vyl 1 ♀.

Oktober: *5te* Skjoldnæs 1 ♂. *17de* Skjoldnæs 3 (1 ♂, 1 ♀ ad., 1 ♀ jun.). *18de* Skjoldnæs 2 (1 ♂, 1 ♀ ad.). *22de* Graadyb 1 ♂. *29de* Vyl 1 ♀ jun. *30te* Vyl 1 ♂.

(1923)

November: *2den* Vyl 1 ♀, Horns Rev 1 ♀, Anholt Knob 1 ♂. *3dje* Vyl 3 (2 ♂, 1 ♀ jun.).

67. *Fringilla montifringilla.* Kvækerfinke.

Marts: *31te* Vyl 1 ♂ ad.

April: *12te* Hesselø 1 ♀. *13de* Horns Rev 1 ♂ ad., Hirtsholmene 1 ♀ jun., Anholt 1 ♂ ad. *14de* Vyl 1 ♀ ad., Læsø Rende 1 ♀.

Oktober: *2den* Lyngvig 1 ♂. *11te* Østre Flak 1 ♂ ad., Anholt Knob 1 ♀ ad. *12te* Anholt 11 (4 ♂, 7 ♀ ad.). *13de* Skjoldnæs 1 ♂, Christiansø 1 ♀ ad. *18de* Christiansø 1 ♀ ad. *19de* Hjelm 1 ♀ ad., Dueodde 1 ♂. *20de* Vyl 1 ♂ ad., Christiansø 1 ♀ jun. *21de* Horns Rev 1 ♀ ad., Lyngvig 2 ♀, Hesselø 3 (1 ♂ ad., 2 ♀ jun.), Hjelm 1 ♀ ad., Kjels Nor 1 ♀ ad. *27de* Schultz's Grund 1 ♂ ad. *29de* Blaavands Huk 1 ♀ jun., Lyngvig 1 ♂.

November: *2den* Hesselø 2 ♀ ad., Kjels Nor 2 (1 ♂, 1 ♀ ad.). *12te* Kjels Nor 1 ♂ jun.

68. *Cannabina linota.* Irisk.

Marts: *13de* Vyl 1 ♀. *14de* Horns Rev 1 ♂. *15de* Horns Rev 1 ♀.

Oktober: *5te* Horns Rev 1. *12te* Vyl 1 ♂.

December: *27de* Blaavands Huk 1 ♂ jun.

69. *Cannabina linaria.* Graasisken.

November: *1ste* Graadyb 1 ♀ jun.

70. *Emberiza schoeniclus.* Rørspurv.

Oktober: *4de* Omø 1 ♀ ad. *18de* Svaneke 1 ♂. *19de* Dueodde 1 ♂. *21de* Graadyb 1 ♀ jun., Schultz's Grund 1 ♂, Kjels Nor 1 ♂.

November: *2den* Anholt 1 ♂. *9de* Stevns 2 (1 ♂, 1 ♀ ad.).

71. *Emberiza lapponica.* Laplandsverling.

September *22de* Graadyb 1 ♂.

72. *Emberiza nivalis.* Snespurv.

December: *6te* Hesselø 1 ♂ ad. *11te* Gilleleje Flak 1 ♂.

(1923)

Oversigt over de Nætter da Fugle ere komne til Fyrene.

Hver Nat henregnes til den følgende Dag. — Tallet efter Vindretningen betegner Vindstyrken efter Beauforts Skala (0—12), hvor

1	betyder:	Let Brise.	7	betyder:	Trerebet Merssejlskuling.
2	—	: Laber Bramsejlskuling.	8	—	: Klosrebet Merssejlskuling.
3	—	: Bramsejlskuling.	9	—	: Undersejlskuling eller Storm.
4	—	: Merssejlskuling.	10	—	: Haard Storm.
5	—	: Rebet Merssejlskuling.	11	—	: Orkanagtig Storm.
6	—	: Torebet Merssejlskuling.	12	—	: Orkan.

Andre Forkortelser: R. = Regn, Tg. = Taage, Ov. = Overtrukken, Sk. = Skyet. D. = Dis, T. = Torden.

19de Januar.

Lyngvig. S.S.V. 3—4. Ov. En enkelt Stær ved Ruderne.

25de Januar.

Vyl. V.N.V. 3. Sk. 1 Lærke faldt. *Bovbjerg.* V.N.V. 7. Ov. D. Enkelte Stære paa Ruderne.

Alauda arvensis. Vyl 1.

26de Januar.

Schultz's Grund. V.S.V. 5. Ov. En Lærke faldt.

Alauda arvensis 1.

27de Januar.

Kjels Nor. V. 6. Ov. Stære paa Lanterneruderne.

2den Februar.

Anholt Knob. S.V. 4. R. Flere Lærker om Fyret fra Kl. 5 til 7 Form.

5te Februar.

Nakkehoved. S.V. 2. Ov. 1 Lærke faldt, ikke inds.

6te Februar.

Schultz's Grund. S. 4. Ov. Enkelte Lærker ved Fyret; 1 faldt over Bord.

9de Februar.

Horns Rev. S.S.Ø. 7. Ov. Sne. Enkelte Lærker ved Fyret.

10de Februar.

Horns Rev. Ø.S.Ø. 6. Ov. Enkelte Stære ved Fyret. *Hanstholm.* Ø.S.Ø. 4. Ov. Nogle Knortegæs ved Fyret; 3 faldt, ikke inds.

11te Februar.

Dueodde. Ø.S.Ø. 5. Ov. Sne. Enkelte Sjaggere paa Ruderne; 1 faldt.

Turdis pilaris 1.

13de Februar.

Christiansø. Ø.S.Ø. 4. Sne. 10 Sjaggere om Fyret, ingen faldt.

14de Februar.

Dueodde. Ø.S.Ø. 2. Ov. Sne. Enkelte Sjaggere paa Ruderne.

15de Februar.

Horns Rev. Ø.N.Ø. 2. Ov. Enkelte Lærker ved Fyret; 1 faldt, ikke inds.

16de Februar.

Lyngvig. Ø.N.Ø. 1. Ov. 2 Stære ved Ruderne.

18de Februar.

Horns Rev. Ø.S.Ø. 3. Ov. Enkelte Stære ved Fyret; 1 faldt, ikke inds. *Hanstholm.* Ø. 3. Ov. 2 Stære ved Fyret.

Sturnus vulgaris. (Horns Rev 1).

23de Februar.

Horns Rev. S.Ø. 3. Tg. Enkelte Lærker ved Fyret; 3 Fugle faldt.

Alauda arvensis 2.
Sturnus vulgaris 1.

24de Februar.

Vyl. N.Ø. 3. Ov. 1 Lærke faldt.

Alauda arvensis 1

25de Februar.

Kjels Nor. N.Ø. 2. Tg. D. Stære paa Lanterneruderne.

26de Februar.

Vyl. Ø.S.Ø. 7. Snetykning. Enkelte Lærker ved Fyret; 1 faldt.

Alauda arvensis 1.

27de Februar.

Graadyb. S.Ø. 3. Ov. R. 5 Fugle faldt. *Vyl.* S.Ø. 4. R. Lærker, Stære og nogle Viber ved Fyret; enkelte Stære og Lærker faldt uden Bords, 1 Lærke og 1 Solsort paa Dækket. *Horns Rev.* S.Ø. 3. R. D. Viber og Lærker ved Fyret; 1 Lærke faldt.

Alauda arvensis. Graadyb 4, Vyl 1, Horns Rev 1.
Turdus merula. Graadyb 1, Vyl 1.

28de Februar.

Horns Rev. S.Ø. 3. Ov. Enkelte Fugle ved Fyret; 1 Lærke faldt.

Alauda arvensis 1.

1ste Marts.

Vyl. S.S.V. 1. Tg. Enkelte Lærker ved Fyret; 1 faldt. *Horns Rev.* S. 2. D. Omkr. 100 Fugle ved Fyret; 8 faldt. *Lyngvig.* S. 3. Ov. R. D. Endel Stære ved Ruderne.

Tringa alpina. Horns Rev 1.
Alauda arvensis. Vyl 1, Horns Rev 5.
Sturnus vulgaris. Horns Rev 2.

2den Marts.

Vyl. S. 1. Tg. Enkelte Lærker ved Fyret; 1 faldt. *Skjoldnæs.* S. 2. Ov. Tg. 1 Stær ved Ruderne. *Læsø Trindel.* Ø.N.Ø. 3. Sk. Sne. En Lærke faldt.

Alauda arvensis. Vyl 1, Læsø Trindel 1.

3dje Marts.

Hanstholm. Ø.S.Ø. 3. Ov. Flere Stære ved Ruderne; Viber hørtes. *Anholt.* S.Ø. 3. Tg. Endel Lærker og Stære ved Ruderne; 2 Lærker faldt, ikke inds. *Nakkehoved.* Vind 0. Ov. Tg. Enkelte Lærker om Fyret; 1 faldt, ikke inds. *Dueodde.* Ø.N.Ø. 3. Ov. Tg. Enkelte Stære paa Ruderne.

4de Marts.

Vyl. Ø.N.Ø. 1. Ov. Flere Lærker ved Fyret; 1 faldt.

Alauda arvensis 1.

5te Marts.

Graadyb. S. 1. Ov. 4 Fugle faldt. *Vyl.* S. 3. R. Enkelte Lærker og Stære ved Fyret; 2 Lærker faldt. *Anholt.* S.S.Ø. 3. D. Flere Solsorter og Stære opholdt sig om Fyret.

Alauda arvensis. Graadyb 3, Vyl 2.

Sturnus vulgaris. Graadyb 1.

6te Marts.

Graadyb. S. 3. Ov. 1 Vibe faldt. *Horns Rev.* S.S.V. 4. R. D. Flere Flokke Stære ved Fyret; ved Daggry kredsede de rundt om Skibet og fløj derpaa mod S.Ø.

Vanellus cristatus. Graadyb 1.

Sturnus vulgaris. Horns Rev 3.

7de Marts.

Skagen. S.Ø. 3. Ov. Sigtbart. En Stær ved Ruderne. *Anholt.* S.Ø. 5. Sk. Nogle Solsorter ved Ruderne. *Kjels Nor.* V.—S. 2. Ov. D. Tg. Flere Drosler og Stære paa Lanterneruderne; 1 Vindrossel faldt, ikke inds. *Skjoldnæs.* S.V.—S. 2. Ov. D. Tg. Træk af Strandskader; c. 10 Stære og 2 Solsorter ved Ruderne; 1 Solsort og 2 Lærker faldt, ikke inds. *Dueodde.* S.S.Ø. 2. Ov. Enkelte Stære paa Ruderne, 1 faldt.

Sturnus vulgaris. Dueodde 1.

9de Marts.

Anholt. Ø. 3. Sne. Nogle Sjaggere og Stære ved Ruderne; 2 Sjaggere faldt, ikke inds.

10de Marts.

Skjoldnæs. Ø.N.Ø. 4. Ov. 1 Stær ved Ruderne.

11te Marts.

Østre Flak. Ø.S.Ø. 3. Sne. Enkelte Smaafugle ved Fyret; 1 Lærke faldt, ikke inds.

12te Marts.

Graadyb. Ø.S.Ø. 3. Ov. 2 Stære faldt. *Vyl.* S.Ø. 2. Ov. Mange Fugle ved Fyret, særlig Viber, Lærker og Stære; enkelte faldt i Vandet, 2 Lærker paa Dækket. *Læsø Trindel.* Ø.N.Ø. 3. Sne. Smaafugle ved Fyret paa Hundevagten; 1 Lærke faldt, ikke modt. *Hjelm.* S.S.Ø. 3. D. Enkelte Stære ved Ruderne. *Schultz's Grund.* Ø. 3. Ov. Sne. Enkelte Smaafugle ved Fyret; 1 Lærke faldt. *Omø.* Ø. 4. R. Nogle Stære ved Ruderne efter Midnat.

Alauda arvensis. Vyl 2, Schultz's Grund 1.
Sturnus vulgaris. Graadyb 2.

13de Marts.

Vyl. S.Ø. 2. Ov. Mange Viber og Strandskader saas flyve forbi Fyret samt hørtes. Enkelte Stære og Lærker ved Fyret; 2 Fugle faldt. *Horns Rev.* S.S.Ø. 3. Ov. Nogle Smaafugle ved Fyret; 3 Stære faldt. *Lyngvig.* S.Ø. 2. Ov. R. Stære ved Ruderne. *Østre Flak.* S.Ø. 2. Sne. Enkelte Smaafugle ved Fyret; endel faldt i Vandet. *Schultz's Grund.* S.Ø. 3. Ov. R. Enkelte Smaafugle ved Fyret; 1 Lærke faldt. *Sejrø.* S.S.Ø. 2. Enkelte Smaafugle ved Ruderne; 1 Lærke faldt, ikke inds. *Nakkehoved.* N. 2. Ov. Enkelte Lærker og Stære omkring Lanternerne; 1 Lærke faldt, ikke inds. *Stevns.* Ø. 2. Ov. Enkelte Stære ved Ruderne. *Omø.* Ø.S.Ø. 3. 1 Lærke faldt, ikke inds.

Alauda arvensis. Schultz's Grund 1.
Sturnus vulgaris. Vyl 1, Horns Rev 3.
Cannabina linota. Vyl 1.

14de Marts.

Graadyb. Ø.N.Ø. 2. Ov. 1 Rødkælk faldt. *Vyl.* Ø. 2. Ov. Nogle Smaafugle ved Fyret, 10 faldt. *Horns Rev.* Ø.S.Ø. 2. Ov. Nogle Smaafugle ved Fyret, 3 faldt. *Lodbjerg.* Ø. 1. Ov. D. Endel Lærker og Drosler paa Ruderne; 1 Lærke faldt, ikke inds. *Østre Flak.* Ø. 2. Ov. Enkelte Smaafugle ved Fyret hele Natten. *Egense Bagfyr.* S.Ø. 2. Ov. Tg. Mange Drosler ved Fyrene; 7 faldt, ikke modtagne. *Anholt.* N.Ø. 1. Sk. Nogle Stære ved Ruderne, intet faldt. *Schultz's Grund.* Ø. 2. Ov. Enkelte Smaafugle

ved Fyret; 1 Lærke faldt. *Omø.* Ø.N.Ø. 3. D. Nogle Lærker paa Ruderne om Efternatten. *Kjels Nor.* N.Ø. 2. Ov. Stære og Drosler paa Ruderne; 1 Sangdrossel faldt, ikke inds.

Tringa alpina. Vyl 1.
Alauda arvensis. Schultz's Grund 1.
Sturnus vulgaris. Vyl 1 (8 faldt).
Anthus pratensis. Vyl 1, Horns Rev 2.
Erithacus rubecula. Graadyb 1.
Cannabina linota. Horns Rev 1.

15de Marts.

Graadyb. Ø.N.Ø. 4. Ov. 1 Stær faldt. *Vyl.* Ø.N.Ø. 3. Ov. Mange Lærker og Stære og enkelte andre Smaafugle ved Fyret; mange faldt i Vandet, 11 paa Dækket. *Horns Rev.* Ø.N.Ø 3. Ov. 6 Fugle faldt. *Hanstholm.* Ø.N.Ø. 3. Ov. Endel Stære ved Fyret; Solsorter, Sjaggere og Viber hørtes omkring Fyret. *Læsø Trindel.* N.Ø. 2. Ov. Smaafugle ved Fyret fra Midnat; 4 Lærker og 1 Graaspurv faldt, ikke indsendte. *Østre Flak.* N.Ø. 2. Ov. Mange Smaafugle ved Fyret; 10 Lærker faldt. *Anholt Knob.* N.Ø. 3. D. Endel Lærker om Fyret, 7 faldt. *Anholt.* N.Ø. 3. Tg. Nogle Lærker ved Ruderne. *Hesselø.* N.Ø. 2. Ov. 6 Lærker faldt. *Schultz's Grund.* Ø.N.Ø. 3. Klart. Enkelte Smaafugle ved Fyret; 3 Lærker faldt. *Kjels Nor.* N.Ø. 6. Ov. Stære og Drosler paa Ruderne; 1 Stær faldt, ikke indsendt. *Skjoldnæs.* Ø. 3. Ov. 6 Stære ved Ruderne. *Dueodde.* Ø.N.Ø. 4. Ov. D. Enkelte Lærker paa Ruderne, 1 faldt.

Alauda arvensis. Horns Rev 3, Østre Flak 10, Anholt Knob 7, Hesselø 6, Schultz's Grund 3, Dueodde 1.
Sturnus vulgaris. Graadyb 1, Vyl 1 (10 faldt), (Kjels Nor 1).
Turdus merula. Vyl 1, Horns Rev 2.
Cannabina linota. Horns Rev 1.

16de Marts.

Vyl. Ø.N.Ø. 3. Letsk. Mange Stære sad paa Skibet; 7 Fugle faldt. *Horns Rev.* Ø. 2. Letsk. Enkelte Fugle ved Fyret; 2 Stære faldt. *Lodbjerg.* Ø. 3. Sk. 2 Fugle faldt.

Vanellus cristatus. Lodbjerg 1.
Alauda arvensis. Vyl 1 (2 faldt), Lodbjerg 1.
Sturnus vulgaris. Vyl 1 (5 faldt), Horns Rev 2.

17de Marts.

Vyl. Ø.N.Ø. 1. Klart. Enkelte Stære ved Fyret, 1 faldt.

Sturnus vulgaris 1.

18de Marts.

Vyl. N.Ø. 1. Klart. Enkelte Stære ved Fyret, 1 faldt.

Sturnus vulgaris 1.

19de Marts.

Nakkehoved. N. 2. To Lærker faldt, ikke indsendte.

20de Marts.

Omø. N.Ø. 2. 1 Skovsneppe faldt.

Scolopax rusticula 1.

22de Marts.

Vyl. Ø.S.Ø. 1. Sk. Mange Stære og enkelte Lærker ved Fyret; Flokke af Viber trak mod Ø.; 15 Fugle faldt.

Alauda arvensis 1.

Sturnus vulgaris 1 (14 faldt).

23de Marts.

Vyl. S.Ø. 3. Ov. Enkelte Stære ved Fyret; 5 faldt.

Sturnus vulgaris 2 (5 faldt).

24de Marts.

Vyl. S. 1. R. Enkelte Stære og Smaafugle ved Fyret; 2 Stære faldt. *Hanstholm.* S.Ø. 3. Ov. Endel Stære ved Ruderne; Viber omkring Fyret; 1 faldt, ikke inds. *Anholt.* V. 1. R. Enkelte Stære ved Ruderne. *Schultz's Grund.* V. 2. Ov. Flere Smaafugle ved Fyret.

Vanellus cristatus. (Hanstholm 1).

Sturnus vulgaris. Vyl 1 (2 faldt).

25de Marts.

Vyl. S.V. 2. Tg. D. Store Flokke Smaafugle ved Fyret, navnlig Stære; 14 Fugle faldt. *Horns Rev.* S.S.V. 1. D. Smaafugle, mest Stære, ved Fyret; 5 Stære faldt. *Lyngvig.* S.V. 2. Ov. Stære ved Ruderne om Natten. *Skagen.* V.S.V. 2. Ov. D. Nogle Stære ved Ruderne. *Hals Barre.* S.V. 1. Ov. Endel Fugle paa Ruderne; 3 faldt. *Anholt Knob.* V.N.V. 3. D. 3 Lærker faldt, ikke inds. *Anholt.* V. 3. D. Endel Stære og Sjaggere ved Ruderne. *Hesselø.* V. 3. Ov. D. 2 Fugle faldt. *Sejrø.* V.S.V. 2. Ov. Enkelte Smaafugle om Lanternen. *Drogden.* S.V. 2. R. 1 Rødkælk faldt. *Stevns.* N.V. 2. Ov. Endel Stære, Lærker o. a. Smaafugle ved Fyret. *Skjoldnæs.* V. 2. Ov. D. Omkr. 30 Stære, Drosler og Rødkælke om Fyret.

Gallinula chloropus. Hals Barre 1.

Vanellus cristatus. Hesselø 1.

Alauda arvensis. Hals Barre 1.
Sturnus vulgaris. Vyl 2 (13 faldt), Horns Rev 5, Hals Barre 1.
Turdus merula. Vyl 1, Hesselø 1.
Erithacus rubecula. Drogden 1.

26de Marts.

Graadyb. S.S.Ø. 2. Ov. En Flok Stære ved Ruderne; 1 faldt. *Vyl.* S.S.Ø. 2. Sk. Enkelte Stære ved Fyret; 2 faldt. *Horns Rev.* S.S.Ø. 2. Ov. Smaafugle, mest Stære, ved Fyret; 3 Stære faldt. *Læsø Trindel.* S.S.Ø. 2. Ov. 11 Fugle faldt mellem Kl. 1 og 4 Form. *Anholt Knob.* S.S.Ø. 2. Tg. D. Mange, Lærker, Stære, Solsorter o. a. Fugle om Fyret. *Anholt.* S.Ø. 2. Tg. Endel Stære, Sjaggere og Lærker ved Ruderne; 13 Fugle faldt. *Hesselø.* S.Ø. 1. Ov. Tg. 3 Lærker faldt. *Stevns.* N.V. 2. Ov. D. 4 Fugle faldt. *Kjels Nor.* V. 2. Ov. Mange Stære, Lærker og Rødkælke paa Ruderne; 1 Vindrossel og 1 Lærke faldt, ikke inds.

Alauda arvensis. Læsø Trindel 6, Anholt 11, Hesselø 3, Stevns 2.
Alauda arborea. Læsø Trindel 1, Stevns 1.
Sturnus vulgaris. Graadyb 1, Vyl 2, Horns Rev 3, Læsø Trindel 2.
Turdus musicus. Stevns 1.
Turdus merula. Læsø Trindel 2.
Erithacus rubecula. Anholt 2.

27de Marts.

Vyl. S.S.Ø. 2. Sk. Enkelte Stære ved Fyret, 1 faldt. *Horns Rev.* S.Ø. 2. D. Enkelte Stære ved Fyret; 1 faldt. *Anholt Knob.* S. 2. D. Flere Smaafugle ved Fyret; 1 Solsort faldt, ikke inds. *Anholt.* S. 2. D. Endel Stære og Rødkælke ved Ruderne.

Sturnus vulgaris. Vyl 1, Horns Rev 1.

28de Marts.

Graadyb. S.Ø. 3. Ov. En Flok Smaafugle ved Fyret; 2 Bogfinker faldt. *Vyl.* Ø.S.Ø. Enkelte Stære ved Skibet. *Horns Rev.* Ø.S.Ø. 3. Tg. Enkelte Smaafugle ved Fyret; 1 Rødkælk faldt.

Erithacus rubecula. Horns Rev 1.
Fringilla coelebs. Graadyb 2.

29de Marts.

Vyl. Ø.S.Ø. 2. Letsk. 1 Krage faldt. *Horns Rev.* Ø.S.Ø. 3. Sk. Enkelte Smaafugle ved Fyret; 1 Bogfinke faldt.

Corvus cornix. Vyl 1.
Fringilla coelebs. Horns Rev 1.

30te Marts.

Vyl. S. 1. Tg. Enkelte Stære ved Fyret; 1 faldt.

Sturnus vulgaris 1.

31te Marts.

Vyl. N. 1. Tg. Enkelte Stære ved Fyret; 1 Kvækerfinke faldt.

Fringilla montifringilla 1.

1ste April.

Vyl. Ø.S.Ø. 4. Ov. Enkelte Smaafugle om Bord; 1 Bogfinke faldt. *Kjels Nor.* Ø. 7. Ov. 1 Solsort faldt, ikke inds.

Fringilla coelebs Vyl 1.

2den April.

Vyl. S.Ø. 2. Letsk. 1 Bogfinke faldt.

Fringilla coelebs 1.

10de April.

Horns Rev. Ø. 5. Ov. Enkelte Kramsfugle ved Fyret; 1 Ringdrossel faldt. *Gilleleje Flak.* 1 Sangdrossel faldt.

Turdus musicus. Gilleleje Flak 1.
Turdus torquatus. Horns Rev 1.

11te April.

Hanstholm. Ø. 2. Ov. Endel Ring- og Vindrosler ved Fyret. *Rubjerg Knude.* S.Ø. 2. Ov. Regnspover, Strandskader og endel Smaafugle ved Fyret fra Kl. 11 til Dag. *Anholt.* S.Ø. 2. D. Endel Stære og et Par Solsorter ved Ruderne. *Hesselø.* Ø. 4. Ov. 3 Fugle faldt. *Sejrø.* Ø.S.Ø. 2. Ov. Endel Smaafugle om Lanternen; 1 Stær og 1 Lærke faldt, ikke inds. *Gilleleje Flak.* 2 Fugle faldt. *Stevns.* Ø. 2. Ov. Smaafugle ved Fyret. *Omø.* Ø.S.Ø. 3. Ov. Endel Stære og Lærker ved Fyret; 3 Lærker faldt. *Kjels Nor.* S.Ø. 2. Ov. Mange Lærker og Stære paa Ruderne; 5 Lærker og 2 Stære faldt, ikke inds. *Skjoldnæs.* Ø. 3. Ov. 10 Stære, 3 Drosler, 1 Graa Fluesnapper og 10 Lærker ved Ruderne; 8 Lærker og 1 Broget Fluesnapper faldt, ikke indsendte.

Vanellus cristatus. Hesselø 1.
Alauda arvensis. Omø 3.
Sturnus vulgaris. (Sejrø 1), Gilleleje Flak 1, (Kjels Nor 2).
Turdus musicus. Hesselø 3, Gilleleje Flak 1.

12te April.

Graadyb. Ø.S.Ø. 2. Sk. Endel Smaafugle ved Fyret om Natten. *Vyl.* Ø. 2. Sk. 1 Rødkælk faldt. *Horns Rev.* Ø. 2. Sk. Enkelte Drosler ved Fyret; 1 Rødkælk faldt. *Lyngvig.* Ø.S.Ø. 2. Ov. Stære ved Ruderne. *Lodbjerg.* Ø. 1. Ov. Enkelte Stære paa Ruderne. *Hanstholm.* Ø. 2. Ov. Ring- og Vindrosler, Stære, Strandskader og Smaafugle ved Fyret. *Skagen.* S.Ø. 2. Ov. Endel Fugle

ved Ruderne; 3 Stære, 1 Skovsneppe og 1 Rødkælk faldt, ikke inds. *Hirtsholmen.* Ø.S.Ø. 2. Ov. 2 Lærker faldt. *Læsø Rende.* Ø.S.Ø. 2. Sk. Nogle Fugle ved Fyret; 3 faldt. *Østre Flak.* S.Ø. 1. Ov. Endel Smaafugle ved Fyret; 4 faldt. *Anholt Knob.* S.Ø. 3. Sk. Endel Smaafugle bl. a. enkelte Drosler ved Fyret om Morgenen; 3 Rødkælke faldt. *Hesselø.* Ø.S.Ø. 3. Ov. 13 Fugle faldt. *Schultz's Grund.* Ø. 2. Ov. 1 Sangdrossel faldt. *Stevns.* Ø.S.Ø. 2. Sk. Lærker og Stære ved Fyret fra Midnat til Daggry.

Columba palumbus. Hesselø 1.
Alauda arvensis. Hirtsholmen 2, Østre Flak 1, Hesselø 2.
Sturnus vulgaris. (Skagen 3), Hesselø 4.
Turdus iliacus. Østre Flak 1, Hesselø 4.
Turdus musicus. Schultz's Grund 1.
Turdus merula. Læsø Rende 1.
Saxicola oenanthe. Læsø Rende 2, Østre Flak 2.
Erithacus rubecula. Vyl 1, Horns Rev 1, Anholt Knob 3, Hesselø 1.
Fringilla montifringil'a. Hesselø 1.

13de April.

Graadyb. S.Ø. 2. Tg. Sk. 1 Stær faldt. *Vyl.* Ø.S.Ø. 2. R. En Mængde Smaafugle ved Fyret; 4 faldt. *Horns Rev.* S.Ø. 3. R. Flere Flokke Drosler og Stære ved Fyret; 8 Fugle faldt. *Hirtsholmen.* S.Ø. 6. Ov. 11 Fugle faldt. *Østre Flak.* S.Ø. 6. Ov. 1 Gerdesmutte faldt, ikke inds. *Anholt.* S.Ø. 3. Sk. Endel Stære og Lærker samt enkelte Vindrosler ved Fyret; 9 Fugle faldt. *Schultz's Grund.* Ø.S.Ø. 5. Ov. 1 Gerdesmutte faldt. *Gilleleje Flak.* 1 Stenpikker faldt. *Skjoldnæs.* Ø.S.Ø. 4. Sk. 2 Stære ved Ruderne.

Alauda arvensis. Anholt 2.
Sturnus vulgaris. Graadyb 1, Horns Rev 2.
Troglodytes parvulus. Graadyb 1.
Phyllopseustes rufus. Vyl 1.
Anthus pratensis. Vyl 1.
Turdus musicus. Horns Rev 5, Hirtsholmen 2 (7 faldt).
Turdus pilaris. Hirtsholmen 1.
Saxicola oenanthe. Hirtsholmen 1, Anholt 3, Gilleleje Flak 1.
Erithacus rubecula. Vyl 1, Hirtsholmen 1, Anholt 3.
Fringilla coelebs. Vyl 1, Horns Rev 2.
Fringilla montifringilla. Horns Rev 1, Hirtsholmen 1, Anholt 1.

14de April.

Vyl. Ø.S.Ø. 2. Tg. En Mængde Smaafugle ved Fyret; 3 faldt. *Lodbjerg.* N.Ø. 2. Ov. R. D. Endel Stære paa Ruderne. *Rubjerg Knude.* Ø.N.Ø. 3. D. Enkelte Vindrosler og endel Smaafugle ved

Fyret fra Midnat til Dag. *Skagen*. Ø.N.Ø. 3. Ov. Fra Midnat til Daggry vare flere Regnspover i Fyrstraalerne og enkelte Stære o. a. Smaafugle ved Ruderne; 1 Storspove (inds.), 1 Drossel og 1 Bekkasin faldt, ikke inds. *Læsø Trindel*. S.Ø. 3. Ov. R. Smaafugle ved Fyret paa Hundevagten; 9 Fugle faldt. *Læsø Rende*. S.Ø. 2. Ov. Tg. Mange Fugle ved Fyret, 4 faldt. *Østre Flak*. S.Ø. 1. Tg. Mange Fugle ved Fyret; 12 Drosler faldt paa Dækket, mange udenbords; intet inds. *Egense Bagfyr*. S.Ø. 3. Ov. Tg. 7 Sangdrosler faldt. *Anholt Knob*. Ø. 2. Sk. Flere Fugle faldt udenbords; 3 paa Dækket. *Anholt*. S.Ø. 5. Sk. Mange Drosler, Stære, Solsorter og Rødkælke om Fyret; c. 87 Fugle faldt. *Hesselø*. Ø. 1. Ov. D. Omkr. 89 Fugle faldt. *Schultz's Grund*. S.Ø. 2. Tg. Mange Kramsfugle, Rødkælke og Bogfinker ved Fyret; 1 Vindrossel faldt. *Nakkehoved*. S. 1. Ov. R. Tg. Mange Smaafugle omkring Lanternen; 1 Stær og 1 Regnspove faldt, ikke inds. *Gilleleje Flak*. 4 Fugle faldt. *Stevns*. Ø.S.Ø. 2—3. Ov. R. D. Stære og Vadefugle ved Fyret fra Kl. 8 til Dag; 8 Fugle faldt. *Christiansø*. Ø.S.Ø. 4. R. Regnspover kredsede om Fyret; 3 Fugle faldt. *Hammeren*. Ø.S.Ø. 4. Ov. D. 6 Stære og 2 Drosler paa Ruderne; endel Skovsnepper sværmede om Fyret. *Dueodde*. Ø.N.Ø. 2. Ov. R. Regnspover hørtes og saas i Straalerne; en Mængde Smaafugle ved Fyret; 23 faldt. *Møen*. Ø.S.Ø. 2. Ov. Tg. D. Meget livligt Træk ved Fyret; særdeles mange Stære og Drosler samt mange Smaafugle ved Fyret; 2 Fugle faldt.

Rallus aquaticus. Hesselø 1.

Numenius arquatus. Skagen 1, Anholt 1.

Alauda arvensis. Dueodde 1.

Sturnus vulgaris. Læsø Trindel 1, Anholt 4, Hesselø 1, (Nakkehoved 1), Gilleleje Flak 1, Stevns 3, Dueodde 2, Møen 1.

Anthus pratensis. Vyl 1.

Turdus iliacus. Anholt 4 (c. 40 faldt), Hesselø 8 (c. 65 faldt), Schultz's Grund 1, Gilleleje Flak 1, Stevns 3, Christiansø 2, Dueodde 14, Møen 1.

Turdus musicus. Læsø Trindel 5, Læsø Rende 3, Anholt Knob 2, Anholt 3 (c. 40 faldt), Hesselø 2 (c. 15 faldt), Gilleleje Flak 2, Stevns 1, Egense Bagfyr 7, Dueodde 6.

Turdus pilaris. Anholt 2, Hesselø 2.

Turdus merula. Læsø Trindel 1, Hesselø 2.

Saxicola oenanthe. Læsø Trindel 2, Hesselø 1, Christiansø 1.

Erithacus rubecula. Vyl 1, Hesselø 2, Stevns 1.

Fringilla coelebs. Anholt Knob 1.

Fringilla montifringilla. Vyl 1, Læsø Rende 1.

15de April.

Graadyb. V. 1. Tg. 2 Stære faldt. *Vyl.* N.V. 2. Tg. En Mængde Smaafugle om Fyret, 2 faldt. *Horns Rev.* N.V. 1. Tg. Enkelte Stære og Krager ved Fyret; 4 Fugle faldt. *Skagen.* Ø.N.Ø. 3. Ov. 2 Fugle faldt. *Læsø Trindel.* Ø.N.Ø. 3. Ov. Fugle ved Fyret hele Natten; 6 Fugle faldt. *Læsø Rende.* N.Ø. 4. Ov. 1 Sangdrossel faldt. *Anholt Knob.* N.Ø. 2. D. Mange Smaafugle om Fyret, 2 faldt. *Anholt.* N.Ø. 2. Sk. Endel Drosler og Rødkælke ved Ruderne; intet faldt. *Hesselø.* N.Ø. 3. Ov. D. Omkr. 19 Fugle faldt. *Schultz's Grund.* Ø. 2. Ov. Omkr. 30 Fugle ved Fyret hele Natten; 11 faldt. *Sejrø.* Ø.S.Ø. 2. Ov. Tg. Enkelte Smaafugle om Lanternen; 2 Stære, 1 Lærke og 6 Vindrosler faldt, ikke inds. *Nakkehoved.* S. Ov. D. Mange Smaafugle omkring Lanternen; flere Rødkælke og Drosler faldt; intet inds. *Gilleleje Flak.* 5 Fugle faldt. *Drogden.* Ø.N.Ø. 2. Ov. Mange Smaafugle ved Fyret. *Stevns.* N.N.Ø. 2. Ov. R. D. Nogle Smaafugle ved Fyret. *Sprogø.* S.Ø. 1. Tg. Mange Smaafugle om Ruderne. *Christiansø.* N.Ø. 6. R. D. Regnspover kredsede om Fyret. *Dueodde.* N.Ø. 4. Ov. D. 1 Stær paa Ruderne; 3 Fugle faldt. *Hyllekrog.* N.N.V. 3. Ov. Endel Regnspover om Lanternen ved Midnat.

Limnocryptes gallinula. Skagen 1.

Sturnus vulgaris. Graadyb 2, Horns Rev 1, (Sejrø 2).

Anthus pratensis. Horns Rev 2.

Turdus iliacus. Skagen 1, Læsø Trindel 1, Hesselø 2 (c. 8 faldt), Schultz's Grund 1, Dueodde 2.

Turdus musicus. Vyl 1, Læsø Trindel 4, Læsø Rende 1, Anholt Knob 1, Hesselø 3 (c. 8 faldt), Schultz's Grund 3 (7 faldt), Gilleleje Flak 3, Dueodde 1.

Turdus merula. Hesselø 2.

Saxicola oenanthe. Horns Rev 1, Schultz's Grund 3.

Erithacus rubecula. Læsø Trindel 1, Anholt Knob 1, Hesselø 1, Gilleleje Flak 2.

Fringilla coelebs. Vyl 1.

16de April.

Vyl. N.Ø. 3. Sk. 1 Engpiber faldt. *Horns Rev.* N.Ø. 3. Sk. 2 Fugle faldt. *Anholt Knob.* N.Ø. 5. Sne. Enkelte Smaafugle rundt om Fyret; 2 faldt. *Schultz's Grund.* N.Ø. 3. Sk. 1 Rødkælk faldt. *Skjoldnæs.* N.N.Ø. 3. Ov. 4 Vindrosler ved Fyret; 1 faldt, ikke inds. *Dueodde.* N.N.Ø. 5. Ov. R. D. Træk af Regnspover; Drosler og Smaafugle paa Ruderne.

Sturnus vulgaris. Anholt Knob 1.
Anthus pratensis. Vyl 1.
Turdus iliacus. Horns Rev 1.
Saxicola oenanthe. Horns Rev 1.
Erithacus rubecula. Anholt Knob 1, Schultz's Grund 1.

17de April.

Vyl. N.Ø. 3. Sk. 1 Stenpikker faldt.
Saxicola oenanthe 1.

18de April.

Vyl. Ø.N.Ø. 1. Sk. 2 Fugle faldt.
Alauda arvensis 1.
Turdus musicus 1.

19de April.

Horns Rev. N.Ø. 2. Klart. Enkelte Stære ved Fyret; 2 faldt. *Schultz's Grund.* 1 Bogfinke faldt.
Sturnus vulgaris. Horns Rev 2.
Fringilla coelebs. Schultz's Grund 1.

21de April.

Horns Rev. Ø.N.Ø. 2. Klart. Smaafugle ved Fyret; 1 Skovspurv faldt. *Schultz's Grund.* Ø. 2. Halvklart. 1 Gerdesmutte faldt.
Troglodytes parvulus. Schultz's Grund 1.
Passer montanus. Horns Rev 1.

24de April.

Anholt. N.V. 1. Sk. Enkelte Drosler og Stære ved Ruderne; intet faldt. *Gilleleje Flak.* 1 Sangdrossel faldt.
Turdus musicus. Gilleleje Flak 1.

26de April.

Vyl. S.S.V. 2. Tg. 1 Sangdrossel faldt. *Anholt.* S.S.V. 6. R. Endel Drosler om Fyret; intet faldt. *Gilleleje Flak.* 1 Sangdrossel faldt. *Kjels Nor.* S.S.V. 2. Ov. R. 1 Vindrossel faldt; ikke inds. *Dueodde.* S. 4. Ov. R. Smaafugle paa Ruderne.
Turdus musicus. Vyl 1, Gilleleje Flak 1.

30te April.

Vyl. S.V. 2. Tg. 2 Fugle faldt.
Turdus musicus. Vyl 1.
Fringilla coelebs. Vyl 1.

4de Maj.

Anholt. Vind 0. Sk. Endel Rødkælke ved Ruderne; ingen faldt.

5te Maj.

Anholt Knob. S.S.Ø. 3. Sk. Enkelte Smaafugle ved Fyret. *Anholt.* S. 5. D. 41 Fugle faldt paa Dækket, 9 Gange saa mange

i Vandet. *Christiansø.* S.Ø. 3. R. Smaafugle paa Ruderne. *Due=odde.* S. 2. Ov. R. D. En Mængde Smaafugle paa Ruderne; 4 faldt.

Iynx torquilla. Anholt 3.
Acrocephalus phragmitis. Dueodde 1.
Phyllopseustes trochilus. Anholt 4.
Turdus musicus. Anholt 15, Dueodde 1.
Turdus pilaris. Anholt 9.
Turdus torquatus. Anholt 2.
Saxicola oenanthe. Anholt 1.
Praticola rubetra. Anholt 1.
Ruticilla phoenicura. Anholt 6, Dueodde 2.

6te Maj.

Vyl. S.V. 3. Klart. 1 Løvsanger faldt. *Anholt Knob.* V.N.V. 3. Sk. 4 Fugle faldt.

Phyllopseustes trochilus. Vyl 1, Anholt Knob 2.
Turdus musicus. Anholt Knob 1.
Ruticilla phoenicura. Anholt Knob 1.

7de Maj.

Læsø Trindel. V. 4. Ov. Fugle ved Fyret paa Hundevagten; 2 faldt. *Schultz's Grund.* V. 4. Ov. Flere Smaafugle ved Fyret; 3 faldt. *Vestborg.* S.V. 2—3. Tg. 4 Fugle faldt. *Gilleleje Flak.* S.V. 2. D. 8 Fugle faldt. *Sprogø.* V. 2. Tg. Mange Smaafugle ved Ruderne. *Skjoldnæs.* V.N.V. 3. Ov. D. Omkr. 30 Fluesnappere ved Ruden.

Sylvia cinerea. Læsø Trindel 1.
Acrocephalus phragmitis. Vestborg 1.
Phyllopseustes trochilus. Læsø Trindel 1, Vestborg 1, Gilleleje Flak 4.
Saxicola oenanthe. Schultz's Grund 2.
Praticola rubetra. Schultz's Grund 1.
Ruticilla phoenicura. Gilleleje Flak 3.
Muscicapa atricapilla. Vestborg 2, Gilleleje Flak 1.

8de Maj.

Schultz's Grund. N.V. 3. Sk. Flere Smaafugle ved Fyret; 3 faldt.

Phyllopseustes trochilus 1.
Ruticilla phoenicura 2.

10de Maj.

Vestborg. Skiftende Vinde. Klart. Endel Smaafugle om Fyret til Solopgang; 5 faldt.

Podicipes nigricollis 3.
Acrocephalus phragmitis 1.
Muscicapa atricapilla 1.

11te Maj.

Hanstholm. Ø.S.Ø. 3. Ov. En Mængde forskellige Smaafugle ved Ruderne fra Midnat til Daggry.

12te Maj.

Dueodde. S. 3. Ov. Smaafugle paa Ruderne.

13de Maj.

Nakkehoved. S. 1. Ov. R. Enkelte Kongefugle ved Ruderne. *Skjoldnæs.* V.S.V. 2. Ov. R. 4 Fluesnappere ved Ruderne.

16de Maj.

Skjoldnæs. S.S.V. 3. Ov. R. 2 Brogede Fluesnappere ved Ruderne.

19de Maj.

Stevns. S.V. 3. Ov. R. D. Forskellige Smaafugle ved Fyret fra Kl. 11^{30} til Daggry.

20de Maj.

Kjels Nor. S.V. 3. Ov. R. 3 Fluesnappere faldt; ikke inds.

24de Maj.

Vyl. N.V. 3. Ov. 1 Sivsanger faldt.

Acrocephalus phragmitis 1.

26de Maj.

Vyl. S.S.Ø. 1. Sk. 1 Tornsanger faldt.

Sylvia cinerea 1.

27de Maj.

Vyl. N.Ø. 1 Letsk. 1 Løvsanger faldt. *Vestborg.* 1 Mudderklire faldt.

Actitis hypoleuca. Vestborg 1.
Phyllopseustes trochilus. Vyl 1.

28de Maj.

Vestborg. En Rørsanger faldt.

Acrocephalus arundinaceus 1.

20de Juni.

Hesselø. 1 Ringgaas faldt.

Anser torquatus 1.

29de Juli.

Kjels Nor. S.S.Ø. 5. Ov. R. 1 Mursvale faldt; ikke inds

31te Juli.

Vyl. S.V. 2. Sk. 1 Taarnfalk faldt.

Falco tinnunculus 1.

7de August.

Schultz's Grund. S.V. 3. Ov. 1 Mursejler faldt.

Cypselus apus 1.

8de August.

Lyngvig. V.S.V. 1. Ov. D. Regnspover og Klirer om Fyret. *Hanstholm.* V. 3. Ov. Endel Regnspover omkring Fyret.

9de August.

Lyngvig. V.S.V. 1. Ov. D. Regnspover, Klirer samt enkelte Maager ved Fyret. *Kjels Nor.* V.N.V. 3. Ov. 1 Islandsk Ryle faldt.

Tringa canutus. Kjels Nor 1.

14de August.

Lyngvig. N.V. 3. Ov. D. Regnspover om Fyret.

18de August.

Lyngvig. S.Ø. 3. Ov. D. Regnspover og endel Smaafugle om Fyret. *Skjoldnæs.* V.N.V. 2. R. 1 Ryle faldt.

Tringa alpina 1.

19de August.

Blaavands Huk. N. 3. Graat. 2 Ryler faldt. *Lodbjerg.* N.Ø. 4. Ov. R. Enkelte Smaafugle paa Ruderne; 1 Enkelt Bekkasin faldt, ikke inds. *Hanstholm.* N. 3. Regnspover og Smaafugle ved Fyret.

Tringa alpina. Blaavands Huk 2.

22de August.

Hirtsholmen. S. 4. Td. R. 2 Splitterner faldt. *Skjoldnæs.* S. 3. Ov. R. Td. Regnspovetræk fra Kl. 11^{45} til 12.

Sterna cantiaca. Hirtsholmen 2.

23de August.

Rubjerg Knude. S.V. 3. Ov. Forskellige Smaafugle ved Fyret fra Midnat til Dag.

26de August.

Hammeren. V.S.V. 2. Ov. 1 Mursejler faldt.

Cypselus apus 1.

30te August.

Anholt Knob. S.Ø. 5. R. Flere Smaafugle ved Fyret fra Kl. 3 til 4 Form. *Gedser Rev.* S. 3. R. 12 Fugle faldt.

Sylvia cinerea. Gedser Rev 1.
Sylvia hortensis. Gedser Rev 1.
Phyllopseustes trochilus. Gedser Rev 3.
Saxicola oenanthe. Gedser Rev 1.
Ruticilla phoenicura. Gedser Rev 3.
Muscicapa atricapilla. Gedser Rev 3.

6te September.

Blaavands Huk. V.N.V. 5. R. 1 Islandsk Ryle faldt. *Lyngvig.* V.N.V. 4. Ov. R. 2 Fugle faldt. *Kjels Nor.* V.N.V. 5. Ov. R. 1 Ryle faldt, ikke inds.

Tringa canutus. Blaavands Huk 1, Lyngvig 1.
Muscicapa atricapilla. Lyngvig 1.

7de September.

Hanstholm. S.V. 2. Ov. En Mængde Smaafugle om Ruderne; 8 faldt.

Tringa canutus 1.
Tringa alpina 1.
Sylvia cinerea 1.
Phyllopseustes trochilus 2.
Saxicola oenanthe 1.
Ruticilla phoenicura 1.
Muscicapa atricapilla 1.

8de September.

Blaavands Huk. N.V. 4. R. 1 Islandsk Ryle faldt. *Kjels Nor.* N.V. 5. Sk. 1 Gerdesmutte faldt; ikke inds. *Gedser Rev.* N.V. 5. R. Enkelte Smaafugle, bl. a. Vipstjerte og Taarnsvaler, om Fyret.

Tringa canutus. Blaavands Huk 1.

9de September.

Kjels Nor. V. 4. Sk. 1 Gerdesmutte faldt, ikke inds. *Dueodde.* V.N.V. 3. Sk. Enkelte Smaafugle paa Ruderne; 1 Gøg faldt.

Cuculus canorus. Dueodde 1.

10de September.

Læsø Rende. V.S.V. 3. Sk. D. Enkelte Smaafugle ved Fyret; 1 Stenpikker faldt.

Saxicola oenanthe 1.

11te September.

Kjels Nor. S.V.—N.V. 3 Letsk. 1 Fluesnapper og en Rødkælk faldt, ikke inds. *Dueodde.* V.N.V. 3. Ov. Enkelte Smaafugle ved Ruderne; 1 Rødstjert faldt.

Ruticilla phoenicura. Dueodde 1.

12te September.

Blaavands Huk. S.V. 5. Ov. 1 Stenpikker faldt.

Saxicola oenanthe 1.

14de September.

Lyngvig. Ø.S.Ø. 2. Sk. R. Tg. Nogle faa Smaafugle ved Fyret; 5 faldt. *Skjoldnæs.* S.Ø. 2. Sk. 2 Fugle faldt. *Gedser Rev.* S.Ø. 2. Klart. Mange Smaafugle ved Fyret; 16 faldt.

Sylvia hortensis. Lyngvig 4, Skjoldnæs 1.
Phyllopseustes trochilus. Lyngvig 1, Skjoldnæs 1, Gedser Rev 4.
Praticola rubetra. Gedser Rev 1.
Ruticilla phoenicura. Gedser Rev 7.
Erithacus rubecula. Gedser Rev 2.
Muscicapa atricapilla. Gedser Rev 2.

15de September.

Lyngvig. Ø.S.Ø. 2. Tg. Mange Smaafugle om Fyret; 28 faldt. *Bovbjerg*. S. 1. Ov. D. Endel Smaafugle paa Ruderne. *Lodbjerg*. S. 3. Sk. Endel Smaafugle paa Ruderne; 2 Fugle faldt. *Anholt Knob*. S.Ø. 5. Sk. 1 Rødstjert faldt. *Kjels Nor*. S.Ø. 5. Letsk. 1 Løvsanger faldt. *Dueodde*. Ø.S.Ø. 3. Sk. Enkelte Rødstjerte paa Ruderne.

Limnocryptes gallinula. Lodbjerg 1.
Gallinago scolopacina. Lodbjerg 1.
Iynx torquilla. Lyngvig 2.
Sylvia hortensis. Lyngvig 7.
Locustella fluviatilis. Lyngvig 1.
Locustella nævia. Lyngvig 1.
Acrocephalus phragmitis. Lyngvig 1.
Phyllopseustes trochilus. Kjels Nor 1.
Anthus arboreus. Lyngvig 2.
Ruticilla phoenicura. Anholt Knob 2.
Muscicapa atricapilla. Lyngvig 14.

16de September.

Graadyb. S. 1. R. Mange Smaafugle ved Fyret om Aftenen; 2 faldt. *Blaavands Huk*. S.V, 1. R. D. Mange Fugle ved Fyret. *Lyngvig*. S.S.V. 2. Ov. T. R. Mange Fugle om Fyret; især Regnspover og Klirer; Smaafugle i Mindretal, 8 faldt. *Bovbjerg*. S.S.V. 1. Ov. R. Tg. Endel Smaafugle paa Ruderne. *Lodbjerg*. S.V. 2. Ov. D. R. Endel Smaafugle paa Ruderne; Regnspover omkring Fyret; 2 Fugle faldt. *Hanstholm*. S. 3. En Mængde Terner ved Fyret; Regnspover hørtes. *Østre Flak*. S.V. 1. R. Enkelte Smaafugle ved Fyret; 1 Rødstjert faldt. *Schultz's Grund*. V. 1. Ov. Klart. 1 Rødstjert faldt. *Stevns*. S. 2. Ov. D. Forskellige Smaafugle ved Fyret fra Kl. 12^{15} til Daggry. *Kjels Nor*. S.Ø.—N.V.—S.V. 1—2. Ov. R. T. 2 Rødstjerte faldt. *Skjoldnæs*. V.S.V. 2. Ov. R. T. Træk af Regnspover og Viber; c. 50 Smaafugle ved Ruderne; 5 faldt. *Gedser*. S.V. 1. R. D. T. 6 Fugle faldt.

Numenius arquatus. Skjoldnæs 1.
Limosa lapponica. Lodbjerg 1.

Tringa alpina. Lodbjerg 1.
Limnocryptes gallinula. Lyngvig 1.
Sylvia cinerea. Lyngvig 1, Skjoldnæs 1, Gedser 1.
Sylvia hortensis. Gedser 1.
Sylvia atricapilla. Skjoldnæs 1.
Saxicola oenanthe. Graadyb 1, Skjoldnæs 2.
Ruticilla phoenicura. Graadyb 1, Lyngvig 1, Østre Flak 1, Schultz's Grund 1, Kjels Nor 2, Gedser 4.
Muscicapa atricapilla. Lyngvig 5.

17de September.

Blaavands Huk. S.V. 3. Sk. 2 Fugle faldt. *Stevns.* V.S.V. 2. Sk. Forskellige Smaafugle ved Fyret fra Kl. 10^{30} til 4^{30} Form. *Dueodde.* S.V. 3. Ov. R. D. Mange Fugle paa Ruderne; 1 Rødkælk faldt.

Sylvia hortensis. Blaavands Huk 1.
Erithacus rubecula. Dueodde 1.
Muscicapa atricapilla. Blaavands Huk 1.

18de September.

Graadyb. S.S.Ø. 4. R. 2 Fugle faldt. *Dueodde.* Ø.S.Ø. 4. Ov. Et Par Rødstjerte paa Ruderne.

Anthus arboreus. Graadyb 1.
Ruticilla phoenicura. Graadyb 1.

19de September.

Stevns. S.V. 2. Ov. Smaafugle ved Fyret fra Kl. 12^{10} til Daggry. *Dueodde.* V.N.V. 2. Ov. R. D. Mange Smaafugle paa Ruderne; 1 Havesanger faldt.

Sylvia hortensis. Dueodde 1.

20de September.

Dueodde. S.S.V. 2. Ov. 1 Rødstjert paa Ruderne.

21de September.

Østre Flak. S.Ø. 5. R. Enkelte Smaafugle ved Fyret; 1 Stenpikker faldt. *Dueodde.* S.S.Ø. 3. Ov. Mange Smaafugle ved Fyret.

Saxicola oenanthe. Østre Flak 1.

22de September.

Graadyb. V. 3. R. 1 Laplandsverling faldt. *Hanstholm.* S.S.V. 2. Ov. Enkelte Smaafugle ved Fyret. *Sejrø.* V.S.V. 3. Ov. D. Endel Smaafugle om Lanternen. *Stevns.* S.V. 2. Ov. R. D. Forskellige Smaafugle ved Fyret fra Kl. 2^{50} til Daggry. *Omø.* V.N.V. 2. R. Nogle Smaafugle ved Fyret om Efternatten; Regnspover kredsede om Fyret; 2 Fugle faldt. *Kjels Nor.* S.V.—V.N.V. 4—7. Ov. R. 1 Broget Fluesnapper faldt. *Skjoldnæs.* V. 2. Ov. R.

Mange Smaafugle ved Ruderne. *Dueodde.* S.V. 3. Ov. R. D. Endel Smaafugle paa Ruderne; 1 Gerdesanger faldt.

Tringa alpina. Omø 1.
Sylvia curruca. Dueodde 1.
Anthus arboreus. Omø 1.
Muscicapa atricapilla. Kjels Nor 1.
Emberiza lapponica. Graadyb 1.

23de September.

Kjels Nor. S.S.V. 5. Ov. R. 3 Fugle faldt. *Skjoldnæs.* S.V. 3. Ov. R. Enkelte Smaafugle ved Fyret.

Phyllopseustes trochilus. Kjels Nor 1.
Ruticilla phoenicura. Kjels Nor 1.
Muscicapa atricapilla. Kjels Nor 1.

26de September.

Graadyb. S.S.V. 3. R. Endel Smaafugle omkring Fyret; 1 Træpiber faldt. *Blaavands Huk.* S.V. 2. R. 1 Broget Fluesnapper faldt. *Kjels Nor.* S. 4. Ov. R. 1 Stenpikker faldt.

Anthus arboreus. Graadyb 1.
Saxicola oenanthe. Kjels Nor 1.
Muscicapa atricapilla. Blaavands Huk 1.

27de September.

Anholt Knob. V.N.V. 2. Sk. 1 Engpiber faldt. *Schultz's Grund.* S.V. 2. Ov. Mange Smaafugle ved Fyret; 1 Engpiber faldt. *Vestborg.* V.—N.V. 1—2. Klart. 1 Mursejler faldt.

Cypselus apus. Vestborg 1.
Anthus pratensis. Anholt Knob 1, Schultz's Grund 1.

28de September.

Blaavands Huk. S.V. 2. R. D. 2 Fugle faldt. *Læsø Trindel.* S. 3. R. 1 Engpiber faldt. *Stevns,* S.S.V. 1. Ov. Smaafugle ved Fyret fra Kl. 3^{15} til Daggry. *Skjoldnæs.* V. 2. Ov. R. D. Enkelte Smaafugle ved Ruderne. *Møen.* Vind 0. Ov. D. 1 Mursejler faldt.

Cypselus apus. Møen 1.
Anthus pratensis. Læsø Trindel 1.
Saxicola oenanthe. Blaavands Huk 1.
Muscicapa atricapilla. Blaavands Huk 1.

29de September.

Blaavands Huk. N.V. 4. Sk. 1 Broget Fluesnapper faldt. *Lyngvig.* N.V. 5. Ov. D. Flere Smaafugle ved Fyret; 3 faldt.

Ruticilla phoenicura. Lyngvig 1.
Muscicapa atricapilla. Blaavands Huk 1, Lyngvig 2.

30te September.

Skjoldnæs. N.V. 3. Ov. 1 Sangdrossel faldt.

Turdus musicus 1.

1ste Oktober.

Schultz's Grund. V.S.V. 3. Ov. Tg. Flere Smaafugle ved Fyret; 4 Engpibere faldt. *Hyllekrog.* S.S.V. 3. D. Endel mindre Fugle saas i Straalerne hele Natten.

Anthus pratensis Schultz's Grund 4.

2den Oktober.

Blaavands Huk. V. 3. Graat. 1 Havesanger faldt. *Lyngvig.* S. 1. R. D. 108 Fugle faldt. *Hyllekrog.* N.V. 4. Sk. Endel mindre Fugle saas i Straalerne hele Natten. *Schultz's Grund.* N.V. 4. Klart. Mange Fugle ved Fyret; 1 Rødstjert faldt. *Skjoldnæs.* V. 1. Ov. D., efter Midnat N.V. 3. Sk. 1 Vandsanger faldt. *Dueodde.* V.S.V. 2. Ov. R. D. Endel Smaafugle ved Fyret; 1 Sivsanger faldt.

Alauda arvensis. Lyngvig 4.
Sturnus vulgaris. Lyngvig 95.
Sylvia hortensis. Blaavands Huk 1.
Acrocephalus aquaticus. Skjoldnæs 1.
Acrocephalus phragmitis. Skjoldnæs 1.
Turdus iliacus. Lyngvig 8.
Ruticilla phoenicura. Schultz's Grund 1.
Fringilla montifringilla. Lyngvig 1.

3dje Oktober.

Lyngvig. V.N.V. 5. Sk. Nogle faa Fugle ved Fyret; 2 faldt.

Turdus musicus 1.
Muscicapa atricapilla 1.

4de Oktober.

Graadyb. Ø.N.Ø. 3. R. 2 Fugle faldt. *Blaavands Huk.* N.Ø. 4. R. 13 Fugle faldt. *Vyl.* Ø. 4. R. Enkelte Smaafugle ved Fyret; 2 Fugle faldt. *Horns Rev.* Ø.N.Ø. 6. Ov. R. 6 Fugle faldt. *Lyngvig.* Ø.N.Ø. 3. Ov. R. Mange Fugle ved Fyret; 40 faldt. *Sprogø.* Ø.S.Ø. 3. Ov. R. Endel Smaafugle ved Fyret. *Omø.* Ø.S.Ø. 5. Ov. Flere Smaafugle ved Ruderne hele Natten; 7 faldt. *Hov.* 1 Mursejler faldt. *Kjels Nor.* S.Ø. 7. Ov. R. 1 Sangdrossel faldt. *Skjoldnæs.* Ø.S.Ø. 4. Ov. R. 8 Drosler ved Fyret; i Lysstraalerne saas mange Fugle; 4 faldt.

Anas crecca. Horns Rev 1.
Tringa alpina. Lyngvig 1.

Limnocryptes gallinula. Horns Rev 1, Lyngvig 3.
Cypselus apus. Hov 1.
Sylvia hortensis. Blaavands Huk 1, Omø 1.
Sylvia atricapilla. Graadyb 1.
Phyllopseustes rufus. Lyngvig 1.
Regulus cristatus. Omø 1.
Anthus obscurus. Graadyb 1.
Turdus iliacus. Blaavands Huk 2, Vyl 1, Horns Rev 1, Lyngvig 4.
Turdus musicus. Blaavands Huk 4, Vyl 1, Horns Rev 2, Lyngvig 22, Kjels Nor 1, Skjoldnæs 3.
Turdus torquatus. Blaavands Huk 1, Horns Rev 1.
Saxicola oenanthe. Lyngvig 2, Omø 1.
Ruticilla phoenicura. Blaavands Huk 2, Lyngvig 6, Skjoldnæs 1.
Erithacus rubecula. Blaavands Huk 1, Lyngvig 1, Omø 3.
Muscicapa atricapilla. Blaavands Huk 2.
Emberiza schoeniclus. Omø 1.

5te Oktober.

Graadyb. N.Ø. 2. Sk. 1 Sangdrossel faldt om Morgenen. *Horns Rev*, N.N.Ø. 3. R. Sk. 4 Fugle faldt. *Hjelm*. V.N.V. 2. Ov. R. Enkelte Drosler ved Ruderne ved Midnat; 1 Sangdrossel faldt. *Drogden*. Ø.N.Ø. 2. R. Flere Smaafugle ved Fyret. *Skjoldnæs*. N.Ø. 2. Ov. R. Enkelte Drosler og Havesangere ved Ruderne; 1 Bogfinke faldt. *Dueodde*. N.Ø. 4. Ov. R. D. Enkelte Drosler paa Ruderne; 1 Vindrossel faldt.

Alauda alpestris. Horns Rev 1.
Anthus obscurus. Horns Rev 1.
Turdus iliacus. Dueodde 1.
Turdus musicus. Graadyb 1, Horns Rev 1, Hjelm 1.
Fringilla coelebs. Skjoldnæs 1.
Cannabina linota. Horns Rev 1.

6te Oktober.

Blaavands Huk. 2 Sangdrosler faldt. *Østre Flak*. N.V. 2. Ov. Endel Smaafugle ved Fyret; 1 Sangdrossel faldt. *Anholt Knob*. S.V. 2. Sk. 1 Sangdrossel faldt. *Nakkehoved*. Vind 0. Ov. Endel Smaafugle omkring Lanternen. *Gilleleje Flak*. 1 Rødkælk faldt. *Drogden*. Ø.N.Ø. 2. R. Flere Smaafugle ved Fyret. *Dueodde*. N.Ø. 2. Ov. Enkelte Fuglekonger og Stære paa Ruderne.

Turdus musicus. Blaavands Huk 2, Østre Flak 1, Anholt Knob 1.
Erithacus rubecula. Gilleleje Flak 1.

7de Oktober.

Rubjerg Knude. S. 2. R. D. Tg. Enkelte Drosler ved Fyret fra Midnat til Dag. *Hirtsholmen*. S. 4. Ov. R. D. 1 Enkelt Bekkasin

faldt. *Anholt Knob.* S. 3. R. Enkelte Fugle om Fyret til Kl. 5—6 Form.; 1 Sangdrossel faldt. *Anholt.* S.S.Ø. 3. Sk. Mange Drosler ved Ruderne; 18 Fugle faldt. *Hesselø.* S.S.V. 4. Ov. D. 11 Fugle faldt. *Schultz's Grund.* S.V. 3. Ov. Mange Fugle ved Fyret. *Vestborg.* S.S.V. 3. Ov. D. 3 Sangdrosler faldt. *Sejrø.* S.S.V. 3. Ov. D. Mange Fugle ved Fyret; 5 faldt. *Drogden.* S.V. 2. Ov. Enkelte Bogfinker ved Fyret. *Stevns.* S.S.V. 2. Ov. Forskellige Smaafugle og Vadefugle ved Fyret fra Kl. 12^{30} til 5 Form. *Skjoldnæs.* S.S.V. 2. Ov. R. D. 1 Lærke faldt. *Dueodde.* N.N V. 1. Ov. Endel Fuglekonger paa Ruderne. *Møen.* V. 3. Ov. R. 1 Sangdrossel faldt. *Hyllekrog.* V.S.V. 3. Ov. D. Endel Drosler i Fyrets Straaler hele Natten; 3 Fugle faldt.

Limnocryptes gallinula. Hirtsholmen 1, Anholt 2, Sejrø 1.
Alauda arvensis. Skjoldnæs 1.
Turdus iliacus. Anholt 3, Hyllekrog 1.
Turdus musicus. Anholt Knob 1, Anholt 12, Hesselø 5 (11 faldt), Vestborg 2, Sejrø 4, Møen 1, Hyllekrog 2.
Erithacus rubecula. Anholt 1.

8de Oktober.

Vyl. S.V. 4. R. 2 Fugle faldt. *Hesselø.* V.S.V. 4. Ov. R. D. 17 Fugle faldt. *Hyllekrog.* S.V. 5. Ov. R. Endel Fugle ved Fyret; 1 Lærke faldt.

Gallinago scolopacina. Hesselø 1.
Limnocryptes gallinula. Hesselø 3 (8 faldt).
Alauda arvensis. Hesselø 5, Hyllekrog 1.
Turdus iliacus. Vyl 1.
Turdus musicus. Vyl 1, Hesselø 3.

9de Oktober.

Blaavands Huk. S.V. 3. R. 1 Vindrossel faldt. *Horns Rev.* S.V. 5. Ov. R. Endel Fugle ved Fyret; 1 Vindrossel faldt. *Anholt.* S.V. 4. R. D. Enkelte Fugle ved Fyret; 3 faldt.

Limnocryptes gallinula. Anholt 2.
Alauda arvensis. Anholt 1.
Turdus iliacus. Blaavands Huk 1, Horns Rev 1.

10de Oktober.

Vyl. V. 6. R. 2 Fugle faldt. *Kjels Nor.* V.N.V. 10. Sk. 1 Enkelt Bekkasin faldt.

Limnocryptes gallinula. Vyl 1, Kjels Nor 1.
Turdus iliacus. Vyl 1.

11te Oktober.

Skagen. V. 5. R. Vindrosler ved Ruderne efter Midnat; 5 faldt.

Læsø Trindel. V. 6. R. Ov. Enkelte Fugle ved Fyret paa Hundevagten; 1 Drossel faldt, ikke inds. *Østre Flak.* V.S.V. 4. Ov. Enkelte Smaafugle ved Fyret; 2 faldt. *Anholt Knob.* V.N.V. 5. Sk. Enkelte Fugle om Fyret; 5 faldt mellem Kl. 3 og 5. *Hesselø.* V. 5. Ov. R. 10 Fugle faldt.

Anas penelops. Hesselø 1.
Turdus iliacus. Skagen 5, Østre Flak 1, Anholt Knob 3, Hesselø 3 (6 faldt).
Turdus musicus. Anholt Knob 1, Hesselø 1 (3 faldt).
Fringilla montifringilla. Østre Flak 1, Anholt Knob 1.

12te Oktober.

Vyl. V. 4. Sk. 1 Irisk faldt. *Nordre Rønner.* V.N.V. 6. Sk. Fra Kl. 12 til 4 Form. var endel Vindrosler ved Fyret. *Anholt Knob.* V.N.V. 7. Klart. Enkelte Fugle om Fyret; 2 faldt lidt efter Midnat. *Anholt.* 6. R. D. Meget stort Fugletræk; c. 190 Fugle faldt.

Tringa alpina. Anholt 1.
Alauda arvensis. Anholt Knob 1.
Sylvia atricapilla. Anholt 1.
Turdus iliacus. Anholt 25 (c. 120 faldt).
Turdus musicus. Anholt Knob 1, Anholt 8 (c. 60 faldt).
Fringilla montifringilla. Anholt 11.
Cannabina linota. Vyl 1.

13de Oktober.

Vyl. V. 5. Sk. 2 Vindrosler faldt. *Lodbjerg.* Ø.S.Ø. 3. Ov. R. 4 Fugle faldt. *Anholt.* S.Ø. 6. D. Endel Drosler om Fyret; 12 faldt, ikke inds. *Stevns.* S.V. 5. R. Mange Drosler og Vadefugle ved Fyret fra Kl. 2^{30} til 5 Form.; 2 Sangdrosler faldt. *Omø.* S. 5. R. 7 Fugle faldt. *Kjels Nor.* S.Ø.—S.—V.S.V. 7. Ov. R. 5 Fugle faldt. *Skjoldnæs.* S.—V. 4. Ov. R. Stort Drosseltræk først paa Natten; 9 Fugle faldt. *Christiansø.* S. 5. R. Enkelte Drosler, Bogfinker o. a. Smaafugle paa Ruderne; 1 Kvækerfinke faldt. *Dueodde.* S.Ø. 4. Ov. R. Enkelte Drosler paa Ruderne; 1 Ringdrossel faldt. *Svaneke.* S.S.V. 7. R. D. 9 Fugle faldt mellem Kl. 12 og 4 Form.

Tringa alpina. Lodbjerg 2, Skjoldnæs 1.
Limnocryptes gallinula. Lodbjerg 1, Omø 1.
Alauda arvensis. Omø 1.
Turdus iliacus. Vyl 2, Lodbjerg 1, Omø 4, Kjels Nor 4, Skjoldnæs 5, Svaneke 3.
Turdus musicus. Stevns 2, Omø 1, Kjels Nor 1, Skjoldnæs 2, Svaneke 6.
Turdus torquatus. Dueodde 1.
Fringilla montifringilla. Skjoldnæs 1, Christiansø 1.

14de Oktober.

Vyl. N.V. 3. Sk. Endel Smaafugle ved Skibet; 3 faldt.

Turdus iliacus 1.
Turdus musicus 2.

15de Oktober.

Blaavands Huk. V.N.V. 2. R. 2 Fugle faldt. *Horns Rev.* N.V. 3. Sk. R. Enkelte Stære ved Ruderne. *Hirtshals.* V.N.V. 4—5. R. 2 Fugle faldt. *Gilleleje Flak.* 1 Sangdrossel faldt. *Omø.* V.S.V. 3. R. 2 Fugle faldt. *Kjels Nor.* V.S.V. 3. Sk. 1 Vindrossel faldt. *Skjoldnæs.* V.S.V. 3. Sk. 3 Fugle faldt. *Dueodde.* S.V. 2. Sk. Endel Fuglekonger paa Ruderne; 2 faldt.

Alauda arvensis. Skjoldnæs 1.
Regulus cristatus. Dueodde 2.
Turdus iliacus. Blaavands Huk 1, Hirtshals 1, Omø 1, Kjels Nor 1, Skjoldnæs 1.
Turdus musicus. Blaavands Huk 1, Hirtshals 1, Gilleleje Flak 1, Omø 1, Skjoldnæs 1.

16de Oktober.

Blaavands Huk. V. 3. R. En Vindrossel faldt. *Horns Rev.* V. 4. Sk. R. Enkelte Drosler og Lærker ved Fyret. *Lyngvig.* V.S.V. 3. Ov. R. 2 Drosler og 1 Stær ved Ruderne om Natten. *Anholt.* N.Ø. 4. D. Enkelte Drosler om Fyret. *Gilleleje Flak.* 1 Sangdrossel faldt. *Skjoldnæs.* V.N.V.—S.V. 3. Sk. 3 Bogfinker (ikke inds.) og 1 Sangdrossel faldt. *Dueodde.* V.N.V. 3. Sk. R. 1 Stær og flere forskelligc Smaafugle paa Ruderne.

Turdus iliacus. Blaavands Huk 1.
Turdus musicus. Gilleleje Flak 1, Skjoldnæs 1.

17de Oktober.

Hesselø. N.N.Ø. 3. Ov. 10 Vindrosler faldt. *Gilleleje Flak.* 1 Vindrossel faldt. *Kjels Nor.* S.V.—V.—N.V. 5. Ov. 1 Vindrossel faldt. *Skjoldnæs.* S.V.—N.N.V. 3. Ov. 3 Bogfinker faldt. *Dueodde.* S.V. 4. Ov. R. Endel Stære og Drosler paa Ruderne; 1 Vindrossel faldt.

Turdus iliacus. Hesselø 3 (10 faldt), Gilleleje Flak 1, Kjels Nor 1, Dueodde 1.
Fringilla coelebs. Skjoldnæs 3.

18de Oktober.

Anholt. S.V. 1. D. Endel Smaafugle om Fyret. *Skjoldnæs.* V.S.V.—V.N.V. 3. Ov. R. 2 Bogfinker faldt. *Dueodde.* V. 4. Ov. Endel Drosler, Stære, Lærker, Fuglekonger, Rødkælke og Gerde-

smutter om Fyret; 5 Fugle faldt. *Svaneke.* S.V 3. Ov. Klart. 4 Fugle faldt mellem Kl. 1—3 Form. *Christiansø.* V.S.V. 4. R. Drosler, Lærker, Rødkælke, Stære og Kongefugle paa Ruderne; 60 Fugle faldt.

Alauda arvensis. Dueodde 2, Christiansø 12.
Turdus iliacus. Svaneke 2, Christiansø 3.
Turdus musicus. Dueodde 2, Svaneke 1, Christiansø 41.
Erithacus rubecula. Dueodde 1, Christiansø 3.
Fringilla coelebs. Skjoldnæs 2.
Fringilla montifringilla. Christiansø 1.
Emberiza schoeniclus. Svaneke 1.

19de Oktober.

Vyl. S.S.Ø. 3. Sk. Mange Smaafugle ved Fyret; 1 Lærke faldt. *Lyngvig.* S.S.V. 5 og S.S.Ø. 2—3. D. Endel Drosler om Fyret; 3 Vindrosler faldt. *Rubjerg Knude.* S.S.V. 2. Ov. D. Endel Drosler ved Fyret fra Kl. 1 til Dag; 7 Vindrosler faldt. *Skagen.* S.S.V. 2. Letsk. Endel Smaafugle, særlig Drosler, enkelte Fuglekonger og Gerdesmutter ved Ruderne fra Kl. 4 til Daggry. *Læsø Trindel.* S.S.V. 2. Ov. Fugle ved Fyret paa Hundevagten og Morgenvagten. *Læsø Rende.* S.S.Ø. 4. Ov. 1 Stær faldt. *Østre Flak.* S.S.V. 2. D. Enkelte Smaafugle ved Skibet; 1 Lærke faldt. *Anholt Knob.* S.V. 1. Tg. Mange Smaafugle om Fyret fra Kl. 3 til 8 Form.; 2 faldt i Vandet. *Hesselø.* S.V. 2. Ov. D. 144 Fugle faldt. *Schultz's Grund.* S.S.V. 1. Ov. 27 Fugle faldt paa Dækket, c. 50 i Vandet. *Hjelm.* S.V. 2. Ov. D. Mange Smaafugle ved Ruderne; 41 Fugle faldt fra Midnat til Kl. 5. *Sejrø.* S.V. 2. Sk. D. Mange Fugle ved Fyret; 29 faldt. *Vestborg.* S.S.V. 3. Ov. T. Hundreder af Fugle ved Fyret; 13 faldt. *Drogden.* S.S.Ø. 4. R. Flere Smaafugle ved Fyret. *Stevns.* S.V. 2. Ov. D. Forskellige Smaafugle ved Fyret fra Kl. 12^{20} til Dag; 2 Fugle faldt. *Sprogø.* S.S.V. 2. Ov. D. Mange Smaafugle, mest Drosler, om Ruderne; 1 Vindrossel faldt. *Omø.* S.V. 2. Tg. 4 Fugle faldt. *Kjels Nor.* S. 5. Ov. R. 5 Fugle faldt. *Skjoldnæs.* S.V. 2. Ov. Tg. 1 Digesmutte ved Ruderne. *Dueodde.* V. 1. Ov. D. Mange Drosler, Lærker, Fuglekonger, enkelte Stære o. a. Smaafugle paa Ruderne; 14 Fugle faldt. *Gedser Rev.* V.S.V. 2. D. Flere Smaafugle ved Fyret; 2 faldt. *Hyllekrog.* S.S.V. 2. D. Endel Drosler og Lærker om Fyret; 3 Fugle faldt.

Tringa alpina. Stevns 1.
Limnocryptes gallinula. Hesselø 1.
Alauda arvensis. Vyl 1. Østre Flak 1, Hesselø 2 (35 faldt), Schultz's Grund 16, Hjelm 4, Sejrø 6, Vestborg 1, Dueodde 4, Gedser Rev 1, Hyllekrog 1.
Sturnus vulgaris. Læsø Rende 1, Vestborg 3, Dueodde 1.
Troglodytes parvulus. Stevns 1.
Phyllopseustes rufus. Omø 1,
Turdus iliacus. Lyngvig 3, Rubjerg Knude 4 (7 faldt), Hesselø 6 (10 faldt), Schultz's Grund 9, Hjelm 33, Sejrø 22, Vestborg 7, Sprogø 1, Omø 2, Kjels Nor 4, Dueodde 2, Hyllekrog 2.
Turdus musicus. Hesselø 2 (6 faldt), Schultz's Grund 1, Hjelm 3, Sejrø 1, Vestborg 2, Kjels Nor 1, Dueodde 2, Gedser Rev 1.
Saxicola oenanthe. Dueodde 1.
Ruticilla phoenicura. Dueodde 1.
Erithacus rubecula. Schultz's Grund 1, Omø 1, Dueodde 1.
Fringilla montifringilla. Hjelm 1, Dueodde 1.
Emberiza schoeniclus. Dueodde 1.

20de Oktober.

Vyl. S.V. 1. Sk. 1 Kvækerfinke faldt. *Hanstholm.* S.Ø. 2. Ov. Enkelte Smaafugle og Knortegæs hørtes. *Anholt.* S.Ø. 6. R. Endel Smaafugle om Fyret. *Stevns.* S. 3. Ov. R. Tg. Smaafugle ved Fyret fra Kl. 11 til Dag. *Sprogø.* S.V. 4. Ov. R. Enkelte Fugle ved Ruderne. *Omø.* S.S.V. 4. R. Tg. 2 Fugle faldt. *Kjels Nor.* S.V. 5. Ov. R. 1 Vindrossel faldt. *Skjoldnæs.* V.S.V. 2. Ov. R. D. 1 Vindrossel og enkelte Smaafugle ved Fyret. *Svaneke.* S.S.V. 5. Ov. R. D. Umaadelig mange Fugle, mest Stære, ved Fyret. Der var saa mange paa Platformen paa Taarnet, at Døren fra Lanternen knap kunde aabnes; da Vagten mellem Kl. 3 og 4 forsøgte at komme ud paa Omgangen, maatte Døren hurtigst muligt lukkes igen, for ikke at faa Lanternen fyldt med Fugle; ved Daggry forsvandt Fuglene igen; 15 Fugle faldt mellem Kl. 12 og 3. *Hammeren.* S. 7. R. Tg. I hundredvis af Stære paa Lanternen hele Natten; 8 faldt. *Dueodde.* S.S.V. 4. Ov. R. D. En Masse Stære og enkelte andre Smaafugle paa Ruderne; 850 Stære taltes, siddende tæt paa Rad paa Gelænderet rundt om Lanternen; medens Mængder, der ikke kunde tælles, sad paa Platform og Galleri; Antallet har vist ialt været omkring 2000; 22 Fugle faldt. *Christiansø.* S.V. 4. R. D. Tusinder af Stære o. a. Smaafugle paa Lanterneomgangen, Ringmuren og omkring Fyret; 66 Fugle faldt paa Fyret; et stort Antal Stære fandtes døde ude paa Øen,

saaledes at det samlede Antal faldne Stære sikkert maa sættes til 100.

Alauda arvensis. Svaneke 3, Dueodde 1, Christiansø 2.

Sturnus vulgaris. Omø 1, Svaneke 12, Hammeren 2 (8 faldt), Dueodde 21, Christiansø 31 (100 faldt).

Turdus iliacus. Omø 1, Kjels Nor 1.

Turdus musicus. Christiansø 2.

Erithacus rubecula. Christiansø 1.

Fringilla montifringilla. Vyl 1, Christiansø 1.

21de Oktober.

Graadyb. S.S.V. 2. Ov. Mange Sangfugle ved Fyret; 10 Fugle faldt. *Blaavands Huk.* S.S.V. 1. Tg. Mange Fugle ved Fyret; 28 faldt. *Vyl.* S.S.Ø. 1. Graat. Mange Lærker faldt i Vandet, 2 paa Dækket. *Horns Rev.* S.S.V. 2. R. Endel Lærker og andre Smaafugle ved Fyret; 8 Fugle faldt. *Lyngvig.* S.V.—S.—S.S.Ø. 1—2. Tg. D. Drosler, Lærker o. a. Smaafugle ved Fyret; 17 Fugle faldt. *Læsø Trindel.* S.V. 2. Sk. Smaafugle ved Fyret paa Morgenvagten. *Anholt.* Vind 0. D. Mange Rødkælke og enkelte Fuglekonger ved Ruderne. *Hesselø.* Ø. 1. Ov. 15 Fugle faldt. *Schultz's Grund.* Vind 0. Ov. 6 Fugle faldt. *Hjelm.* Vind 0. D. 4 Fugle faldt. *Stevns.* V. 2. Ov. D. Smaafugle ved Fyret fra Kl. 1^{30} til Dag; 4 Fugle faldt. *Sprogø.* S.V. 1. Ov. Tg. Mange Fugle om Fyret, enkelte ved Ruderne; 7 faldt. *Omø.* S.V. 2. Ov. Enkelte Smaafugle paa Ruderne paa Efternatten; 3 Troldænder faldt Kl. 4^{30} Form. *Kjels Nor.* S.V. 3. Ov. R. Tg. 5 Fugle faldt.

Anas crecca. Stevns 1.

Fuligula cristata. Omø 3.

Limnocryptes gallinula. Stevns 1, Sprogø 1.

Alauda arvensis. Graadyb 6, Blaavands Huk 2, Vyl 2, Horns Rev 7, Lyngvig 6, Hesselø 4.

Sturnus vulgaris. Graadyb 1, Lyngvig 1, Kjels Nor 1.

Sylvia hortensis. Blaavands Huk 1.

Regulus cristatus. Schultz's Grund 1.

Anthus pratensis. Blaavands Huk 1.

Turdus iliacus. Blaavands Huk 18, Lyngvig 7, Hesselø 2, Hjelm 3, Stevns 1, Sprogø 4, Kjels Nor 2.

Turdus musicus. Graadyb 2, Blaavands Huk 2, Lyngvig 1, Hesselø 3 (4 faldt), Stevns 1, Sprogø 2.

Turdus merula. Blaavands Huk 3.

Erithacus rubecula. Blaavands Huk 1, Hesselø 2, Schultz's Grund 4.

Fringilla montifringilla. Horns Rev 1, Lyngvig 2, Hesselø 3, Hjelm 1, Kjels Nor 1.

Emberiza schoeniclus. Graadyb 1, Schultz's Grund 1, Kjels Nor 1.

22de Oktober.

Graadyb. S.V. 4. Ov. Enkelte Fugle ved Fyret; 2 faldt. *Vyl.* V.S.V. 4. Sk. Endel Smaafugle ved Fyret; 1 Lærke faldt. *Stevns.* S.V. 4. Ov. R. Nogle Drosler ved Ruderne fra Midnat til Kl. 5 Form.

Alauda arvensis. Vyl 1.
Turdus merula. Graadyb 1.
Fringilla coelebs. Graadyb 1.

27de Oktober.

Læsø Trindel. S.Ø. 4. Ov. Smaafugle ved Fyret mellem 8 og 12 Efterm. *Schultz's Grund.* S. 5. R. 1 Kvækerfinke faldt.

Fringilla montifringilla. Schultz's Grund 1.

28de Oktober.

Graadyb. S.V. 1. R. D. Store Mængder Smaafugle ved Fyret om Aftenen; mange faldt i Vandet, 23 paa Dækket. *Lyngvig.* S.Ø. 2. Ov. R. D. Endel Stære og Drosler om Fyret. *Bovbjerg.* S.S.V. 3. Ov. R. D. Mange Stære og Drosler ved Fyret. *Hirtshals.* S.S.Ø. 4. R. 1 Stær faldt. *Østre Flak.* S.Ø. 4. R. Enkelte Smaafugle ved Fyret. *Drogden.* S.Ø. 2. Ov. Endel Smaafugle ved Fyret. *Omø.* S.Ø. 3. Ov. 1 Vindrossel faldt.

Scolopax rusticula. Graadyb 1.
Alauda arvensis. Graadyb 7.
Sturnus vulgaris. Graadyb 7, Hirtshals 1.
Turdus iliacus. Graadyb 4, Omø 1.
Turdus musicus. Graadyb 4.

29de Oktober.

Blaavands Huk. S.V. 2. D. Mange Fugle ved Fyret; 188 faldt. *Vyl.* V.S.V. 1. R. En Mængde Smaafugle sværmede om Fyret og mange faldt i Vandet, 13 paa Dækket. *Horns Rev.* V.S.V. 4. Ov. R. Endel Stære, Lærker og Drosler om Fyret; 7 Fugle faldt paa Dækket, flere udenbords. *Lyngvig.* S.—S.V.—V.—N.V. 3. Sk. R. D. fra Solnedgang til Kl. 10^{30}, da det klarede af. Masser af Fugle fløj forvildede om Fyret; Regnspover og Viber hørtes; Slag i Slag gik det mod det opstaaende, paa Lanternetagets Topspir, Skorsten o. a. Steder; hvis Vejret ikke var klaret op, vilde Fuglefaldet have været umaadeligt; 129 Fugle faldt. *Lodbjerg.* S.V. 4. Ov. R. D. 3 Fugle faldt. *Hirtshals.* S.V. 3. Sk. D. 2 Bjergænder faldt. *Østre Flak.* S. 5. Sk. Endel Smaafugle ved Fyret; 3 faldt. *Hjelm.* S.V. 4. Ov. D. Enkelte Smaafugle ved Ruderne; 1 Stær faldt. *Skjoldnæs.* S.V. 3. Ov. 2 Drosler paa Ruderne.

Anas crecca. Lyngvig 1.
Fuligula marila. Hirtshals 2.
Rallus aquaticus. Lyngvig 1.
Limnocryptes gallinula. Blaavands Huk 1, Vyl 1, Lyngvig 3.
Gallinago scolopacina. Lyngvig 1.
Alauda arvensis. Blaavands Huk 2, Vyl 1 (5 faldt), Horns Rev 5, Lyngvig 2.
Sturnus vulgaris. Blaavands Huk 46, Vyl 1, Horns Rev 1, Lyngvig 14, Østre Flak 1, Hjelm 1.
Turdus iliacus. Blaavands Huk 107, Vyl 1 (5 faldt), Horns Rev 1, Lyngvig 97, Lodbjerg 1, Østre Flak 1.
Turdus musicus. Blaavands Huk 29, Lyngvig 9, Lodbjerg 2, Østre Flak 1.
Turdus merula. Blaavands Huk 1.
Ruticilla phoenicura. Blaavands Huk 1.
Fringilla coelebs. Vyl 1.
Fringilla montifringilla. Blaavands Huk 1, Lyngvig 1.

30te Oktober.

Graadyb. S.V. 4. Ov. 1 Stær faldt. *Vyl.* V. 2. R. 1 Bogfinke faldt.

Sturnus vulgaris. Graadyb 1.
Fringilla coelebs. Vyl 1.

31te Oktober.

Stevns. V.S.V. 2. Ov. R. Enkelte Smaafugle ved Fyret fra Midnat til Kl. 5 Form. *Dueodde.* V. 4. Ov. Enkelte Fuglekonger paa Ruderne.

1ste November.

Graadyb. S. 2. Ov. R. Store Mængder af Smaafugle om Fyret; mange faldt i Vandet, 57 paa Dækket. *Vyl.* V.N.V. 1. Sk. 1 Sangdrossel faldt. *Hjelm.* S.V. 2. Ov. R. D. Mange Stære og Smaafugle ved Ruderne før og efter Midnat; 7 Fugle faldt. *Vestborg.* V. 3. Letsk. 1 Lærke faldt. *Nakkehoved.* S.V. 2. Ov. R. Tg. Mange Smaafugle omkring Lanternen. *Dueodde.* N.V. 2. Ov. D. Enkelte Fuglekonger paa Ruderne.

Corvus frugilegus. Graadyb 1.
Alauda arvensis. Graadyb 3 (5 faldt), Hjelm 5, Vestborg 1.
Sturnus vulgaris. Graadyb 3 (34 faldt), Hjelm 1.
Anthus pratensis. Graadyb 1.
Turdus iliacus. Graadyb 2 (4 faldt), Hjelm 3.
Turdus musicus. Graadyb 2 (5 faldt), Vyl 1.
Turdus merula. Graadyb 2 (4 faldt).
Erithacus rubecula. Graadyb 2.
Cannabina linaria. Graadyb 1.

2den November.

Blaavands Huk. S. 1. R. D. Mange Hundrede Stære ved Fyret; 207 Fugle faldt. *Vyl*. S. 1. R. Stort Træk af Stære om Natten; de sad i hundredevis i Riggen, mange faldt i Vandet; 81 Fugle faldt paa Dækket. *Horns Rev*. S.S.V. 1. R. En Mængde Fugle ved Fyret; 69 Fugle faldt paa Dækket, lige saa mange udenbords. *Lyngvig*. S.Ø.—Ø.N.Ø. 1. Ov. R. D. Vældige Mængder af Stære og enkelte Drosler om Fyret, hvis Ruder formørkedes af Fuglene; Ruder og Platform vare aldeles oversprøjtede med deres stærkt stinkende Ekskrementer; mange Stære og faa Drosler faldt, intet modtaget. *Bovbjerg*. S.S.V. 2. Ov. R. Tg. En Mængde Fugle, navnlig Stære, om Lanternen; 15 Fugle faldt. *Lodbjerg*. S. 2. Ov. R. Endel Smaafugle paa Ruderne. *Hanstholm*. S.S.Ø. 2. R. En Mængde Stære ved Fyret; enkelte Viber hørtes; 12 Fugle faldt. *Skagen*. S.S.V. 2. Ov. R. Flere Vindrosler og enkelte Stære ved Lanterneruderne; 9 Fugle faldt. *Læsø Rende*. S.V. 2. Ov. Flere Fugle ved Fyret; 4 Solsorter og 3 Stære faldt, ikke inds. *Østre Flak*. S.V. 2. R. Endel Smaafugle ved Fyret; 6 faldt. *Anholt Knob*. S.V. 3. Sk. Endel Fugle om Fyret; 4 faldt. *Anholt*. S.V. 3. D. Stære, Drosler, Lærker og Rødkælke ved Ruderne; 28 Fugle faldt. *Hesselø*. S. 3. R. D. 81 Fugle faldt. *Schultz's Grund*. S. 2. D. Mange Fugle ved Fyret; 5 faldt paa Dækket, mange i Vandet. *Sejrø*. V. 2. Sk. D. Enkelte Smaafugle ved Fyret; 5 faldt. *Stevns*. S.V. 2—3. Ov. D. Endel Smaafugle ved Ruderne fra Kl. 8 til Daggry; 2 Fugle faldt. *Omø*. S.S.Ø. 2. R. D. Flere Smaafugle ved Fyret hele Natten; 2 faldt. *Kjels Nor*. S.Ø. 3. Ov. R. 66 Fugle faldt. *Skjoldnæs*. S.Ø. 1. Ov. R. Flere Rødkælke ved Ruderne. *Hammeren*. S.S.Ø. 3. Ov. R. D. Endel Kongefugle paa Ruderne. *Dueodde*. S.S.Ø. 3. R. Enkelte Fuglekonger paa Ruderne. *Gedser Rev*. S.S.Ø. 3. R. Flere Hundrede Fugle ved Fyret; 35 faldt. *Hyllekrog*. S.S.Ø. 2. R. D. Endel Smaafugle omkring Lanternen hele Natten; 9 Drosler og 5 Rødkælke faldt, ikke inds.

Rallus aquaticus. Hesselø 1.

Gallinula chloropus. Blaavands Huk 1.

Limnocryptes gallinula. Blaavands Huk 1.

Gallinago scolopacina. Blaavands Huk 1, Horns Rev 1.

Scolopax rusticula. Bovbjerg 2, Omø 1.

Alauda arvensis. Blaavands Huk 4, Vyl 3, Horns Rev 1, Bovbjerg 4,

Hanstholm 7, Østre Flak 2, Anholt 22, Hesselø 6 (29 faldt), Sejrø 1, Stevns 1, Omø 1, Kjels Nor 1, Gedser Rev 5.

Sturnus vulgaris. Blaavands Huk 167, Vyl 3 (70 faldt), Horns Rev 2 (50 faldt), Bovbjerg 4, Hanstholm 4, Skagen 3, (Læsø Rende 3), Østre Flak 1, Anholt Knob 1, Hesselø 2, Schultz's Grund 2, Kjels Nor 4.

Cinclus aquaticus. Anholt 1.

Phyllopseustes rufus. Gedser Rev 1.

Turdus iliacus. Blaavands Huk 27, Vyl 1, Horns Rev 1 (6 faldt), Bovbjerg 4, Skagen 6, Hesselø 3 (34 faldt), Schultz's Grund 1, Sejrø 3, Stevns 1, Kjels Nor 39, Gedser Rev 16.

Turdus musicus. Blaavands Huk 5, Vyl 1, Hesselø 2 (6 faldt), Schultz's Grund 1, Kjels Nor 9, Gedser Rev 3.

Turdus viscivorus. Hesselø 1.

Turdus pilaris. Hesselø 1.

Turdus merula. Vyl 2, Horns Rev 4, Bovbjerg 1, Østre Flak 1, Hesselø 2, Sejrø 1.

Ruticilla phoenicura. Kjels Nor 1.

Erithacus rubecula. Blaavands Huk 1, Vyl 3, Hanstholm 1, Østre Flak 2, Anholt Knob 2, Anholt 4, Hesselø 3, Schultz's Grund 1, Kjels Nor 10, Gedser Rev 10.

Fringilla coelebs. Vyl 1, Horns Rev 1, Anholt Knob 1.

Fringilla montifringilla. Hesselø 2, Kjels Nor 2.

Emberiza schoeniclus. Anholt 1.

3dje November.

Vyl. S.S.V. 6. R. Mange Fugle ved Fyret; 17 faldt. *Horns Rev.* V. 3. R. Enkelte Fugle ved Fyret; 1 Vindrossel faldt. *Lyngvig.* V.S.V. 6. Ov. R. Endel Fugle om Fyret; 10 Vindrosler faldt. *Skagen.* V.S.V. 3. Halvklart. Mange Smaafugle i Fyrets Straaler; en enkelt Stær og nogle Vindrosler ved Lanternen; 5 Fugle faldt. *Hals Barre.* S.S.V. 4. Sk. Flere Lærker paa Ruderne; 1 faldt. *Stevns.* V.S.V. 3. D. Enkelte Drosler og Rødkælke ved Fyret fra Kl. 4^{30} til Daggry. *Omø.* 4. Ov. 1 Rødkælk faldt. *Gedser Rev.* 1 Rødkælk faldt.

Alauda arvensis. Skagen 1, Hals Barre 1.

Sturnus vulgaris. Vyl 1 (14 faldt).

Turdus iliacus. Horns Rev 1, Lyngvig 10, Skagen 4.

Erithacus rubecula. Omø 1, Gedser Rev 1.

Fringilla coelebs. Vyl 3.

4de November.

Vyl. V. 8. R. Enkelte Fugle ved Fyret; 6 faldt.

Sturnus vulgaris. Vyl 1 (5 faldt).

Turdus musicus. Vyl 1.

5te November.

Vyl. 6. Byger. 3 Stære faldt.

Sturnus vulgaris. Vyl 1 (3 faldt).

6te November.

Vyl. V. 2. R. Enkelte Fugle ved Fyret; 1 Sjagger faldt. *Lyngvig.* V. 3. Ov. R. D. 10 Fugle faldt. *Anholt.* N.Ø. 2. D. Endel Sjaggere omkring Fyret. *Kjels Nor.* S.V.—S.S.Ø. 3. Ov. R. 5 Fugle faldt.

Alauda arvensis. Lyngvig 3.
Sturnus vulgaris. Lyngvig 1.
Anthus pratensis. Kjels Nor 1.
Turdus iliacus Lyngvig 3, Kjels Nor 4.
Turdus pilaris. Vyl 1.

7de November.

Vyl. N.N.Ø. 2. R. Byger. Nogle Fugle ved Fyret; enkelte faldt overbord, 9 paa Dækket. *Horns Rev.* V. 2. Byger. Enkelte Fugle ved Fyret; 2 faldt. *Bovbjerg.* Endel Stære, Drosler og Smaafugle paa Ruderne. *Lodbjerg.* S. 3. Ov. D. Endel Stære og Drosler paa Ruderne. *Sejrø.* V. 2. Ov. Enkelte Smaafugle om Lanternen. *Gedser Rev.* S.V. 4. R. 2 Fugle faldt.

Alauda arvensis. Vyl 2 (6 faldt).
Sturnus vulgaris. Horns Rev 1.
Regulus cristatus. Gedser Rev 1.
Turdus musicus. Vyl 1.
Turdus merula. Vyl 2.
Erithacus rubecula. Horns Rev 1, Gedser Rev 1.

8de November.

Blaavands Huk. S.S.V. 1. R. 16 Fugle faldt. *Vyl.* S.V. 1. Sk. Enkelte Fugle ved Fyret; 2 Lærker faldt. *Bovbjerg.* S.Ø. 1. Ov. Tg. 14 Fugle faldt. *Schultz's Grund.* S. 2. Ov. Mange Fugle ved Fyret; 1 Sjagger faldt. *Sejrø.* S.V. 2. Ov. Tg. Enkelte Smaafugle om Lanternen. *Sprogø.* S.V. 1. Ov. En Mængde Smaafugle ved Ruderne; 4 faldt. *Vejrø.* Vind 0. Ov. 1 Stor Søsvale faldt. *Kjels Nor.* S.S.V. 2. Ov. R. 6 Fugle faldt. *Christiansø.* Ø.S.Ø. 1. Ov. Enkelte Kongefugle paa Ruderne. *Dueodde.* Vind. 0. Ov. Enkelte Fuglekonger og Stære paa Ruderne; 1 Skovsneppe faldt. *Gedser Rev.* S.V. 3. Mange Smaafugle ved Fyret; 38 faldt, indsendte, men ikke modtagne.

Procellaria leucorrhoa. Vejrø 1.
Rallus aquaticus. Bovbjerg 2.

Scolopax rusticula. Bovbjerg 3, Dueodde 1.
Alauda arvensis. Vyl 2, Sprogø 3, Kjels Nor 4.
Sturnus vulgaris. Blaavands Huk 6, Bovbjerg 1, Sprogø 1.
Turdus iliacus. Blaavands Huk 8, Kjels Nor 2.
Turdus pilaris. Blaavands Huk 1, Schultz's Grund 1.
Turdus merula. Blaavands Huk 1, Bovbjerg 8.

9de November.

Graadyb. S.Ø. 3. Tg. 4 Fugle faldt. *Blaavands Huk.* 3 Fugle faldt. *Vyl.* S.Ø. 2. Sk. Mange Fugle i Rigningen og ved Fyret; mange faldt overbord, 43 paa Dækket. *Horns Rev.* S.Ø. Sk. Enkelte Fugle ved Fyret; 1 Stær faldt. *Lyngvig.* Ø. 2. Ov. Tg. Endel Stære om Fyret. *Anholt Knob.* Ø. 3. Sk. Enkelte Smaafugle ved Fyret; 1 Solsort faldt, ikke inds. *Stevns.* N.Ø. 2—3. Ov. Smaafugle ved Fyret fra Kl. 7 til 5 Form.; 6 faldt. *Kjels Nor.* Vind 0. Ov. Mange Lærker, Rødkælke og andre Smaafugle paa Ruderne; Kl. 9 Aften stort Træk af Raager; 1 Lærke faldt. *Skjoldnæs.* S.S.Ø.—N.N.Ø. 2. Sk. To Ugler fløj i Straalerne fra Kl. 7 til 9 Eftm., jagende Natsværmere, ofte helt inde ved Fyret; 2 Lærker faldt. *Christiansø.* Ø.N.Ø. 5. R. Enkelte Smaafugle paa Ruderne. *Dueodde.* Ø.N.Ø. 1. Ov. R. Enkelte Fuglekonger, 1 Stær, 1 Lærke og en Graa Fluesnapper paa Ruderne. En Ugle kredsede om Fyret; 1 Enkelt Bekkasin faldt. *Gedser Rev.* N. 3. Klart. Mange Smaafugle ved Fyret; 33 faldt.

Limnocryptes gallinula. Vyl 1, Dueodde 1.
Scolopax rusticula. Gedser Rev 1.
Alauda arvensis. Graadyb 2, Vyl 4 (22 faldt), Stevns 3, Kjels Nor 1, Skjoldnæs 2, Gedser Rev 15.
Sturnus vulgaris. Blaavands Huk 2, Vyl 1 (12 faldt), Horns Rev 1.
Troglodytes parvulus. Gedser Rev 2.
Regulus cristatus. Gedser Rev 6.
Turdus iliacus. Blaavands Huk !, Vyl 1.
Turdus pilaris. Stevns 1.
Turdus merula. Graadyb 1, Vyl 2 (8 faldt).
Erithacus rubecula. Graadyb 1, Gedser Rev 9.
Emberiza schoeniclus. Vyl 1, Stevns 2.

10de November.

Vyl. N.Ø. 5. Letsk. 1 Lærke faldt. *Schultz's Grund.* N.N.Ø. 6. Halvklart. Mange Fugle ved Fyret. *Dueodde.* N. 9. Ov. R. 1 Enkelt Bekkasin faldt.

Limnocryptes gallinula. Dueodde 1.
Alauda arvensis. Vyl 1.

11te November.

Blaavands Huk. N.V. 2. Sk. 5 Stære faldt. *Vyl*. V.N.V. 2. Sk. 1 Lærke faldt.

Alauda arvensis. Vyl 1.

Sturnus vulgaris. Blaavands Huk 5.

12te November.

Kjels Nor. V.S.V. 4. Ov. 3 Fugle faldt. *Dueodde*. V. 4. Ov. 1 Enkelt Bekkasin faldt.

Limnocryptes gallinula. Dueodde 1.

Alauda arvensis. Kjels Nor 1.

Sturnus vulgaris. Kjels Nor 1.

Fringilla montifringilla. Kjels Nor 1.

13de November.

Østre Flak. S.V. 4. R. 1 Blishøne faldt. *Møen*. V. 5. Ov. D. senere klart. 1 Gerdesmutte faldt. *Gedser Rev*. V.S.V. 6. Endel Fugle ved Fyret; 1 Sjagger faldt.

Fulica atra. Østre Flak 1.

Troglodytes parvulus. Møen 1.

Turdus pilaris. Gedser Rev 1.

14de November.

Blaavands Huk. S.V. 8. R. D. 1 Vandrikse faldt. *Gilleleje Flak*. S.V. 7. R. D. 1 Sjagger faldt.

Rallus aquaticus. Blaavands Huk 1.

Turdus pilaris. Gilleleje Flak 1.

19de November.

Vyl. V.S.V. 6. Byger. 1 Sjagger faldt.

Turdus pilaris. Vyl 1.

22de November.

Vyl. N.Ø. 2. Sne. Enkelte Stære og Solsorter ved Skibet; 1 Stær faldt.

Sturnus vulgaris. Vyl 1.

23de November.

Vyl. Ø. 3. Letsk. Enkelte Stære ved Skibet.

25de November.

Stevns. V.S.V. 2—3. Ov. 1 Rørhøne faldt.

Gallinula chloropus. Stevns 1.

1ste December.

Omø. S.S.V. 3. D. 2 Drosler ved Ruderne efter Midnat.

2den December.

Gedser Rev. S.S.V. 3. Ov. 1 Stær og flere Smaafugle ved

Ruderne; 3 Sjaggere faldt. *Hyllekrog*. S. 5. Ov. D. Endel Fugle, deriblandt Sjaggere, omkring Fyret hen paa Morgenen.

Turdus pilaris. Gedser Rev 3.

3dje December.

Gedser Rev. S.Ø. 2. Sne. 1 Graastrubet Lappedykker faldt.

Podicipes griseigena. Gedser Rev 1.

4de December.

Vyl. S.S.V. 3. Sk. 1 Enkelt Bekkasin faldt. *Hals Barre*. Ø. 3. Ov. Enkelte Fugle ved Fyret; 1 Sjagger faldt. *Sprogø*. S.V. 2. Ov. D. Enkelte Stære ved Ruderne.

Limnocryptes gallinula. Vyl 1.
Turdus pilaris. Hals Barre 1.

6te December.

Hesselø. N. 3. Ov. 12 Fugle faldt. *Hyllekrog*. Ø.S.Ø. 2. Ov. D. Endel Sjaggere paa Ruderne hen paa Morgenen.

Turdus pilaris. Hesselø 7 (11 faldt).
Emberiza nivalis. Hesselø 1.

7de December.

Lyngvig. Ø. 2. Ov. Tg. D. Nogle faa Drosler og Stære om Fyret; 2 Fugle faldt. *Læsø Trindel*. N. 2. Ov. Smaafugle ved Fyret paa Morgenvagten. *Nakkehoved*. Ø. 2. Ov. D. 1 Stær faldt. *Skjoldnæs*. N.N.V. 2. Ov. Tg. 1 Sjagger faldt. *Dueodde*. N.V. 1 Ov. D. 1 Sortgraa Ryle faldt.

Tringa maritima. Dueodde 1.
Sturnus vulgaris. Lyngvig 1, Nakkehoved 1.
Turdus pilaris. Lyngvig 1, Skjoldnæs 1.

8de December.

Omø. S.S.Ø. 2. D. En Flok Ederfugle fløj mod Lanternen; 1 faldt.

Somateria mollissima. Omø 1.

10de December.

Schultz's Grund. S.V. 2. Ov. Enkelte Fugle ved Fyret; 1 Sjagger faldt. *Drogden*. V. 1. Tg. 1 Rørdrum faldt Kl. 2 Form. *Kjels Nor*. N.V. 2. Ov. 1 Rørhøne faldt.

Gallinula chloropus. Kjels Nor 1.
Botaurus stellaris. Drogden 1.
Turdus pilaris. Schultz's Grund 1.

11te December.

Gilleleje Flak. 2 Fugle faldt. *Vejrø*. S.V. 1. Ov. D. En Ederfugl fløj mod Lanternen; ikke inds.

Alauda arvensis. Gilleleje Flak 1.
Emberiza nivalis. Gilleleje Flak 1.

12te December.

Lyngvig. N.Ø. 2. Ov. Tg. Et mindre Antal Stære og Drosler ved Ruderne. *Helnæs.* 2 Lærker faldt.

Alauda arvensis. Helnæs 2.

13de December.

Vyl. S.S.Ø. 2. Sk. 1 Lærke faldt.

Alauda arvensis. Vyl 1.

14de December.

Sprogø. S.V. 1. Ov. D. 1 Rørhøne faldt.

Gallinula chloropus. Sprogø 1.

15de December.

Kjels Nor. V.S.V. 7. Ov. R. D. 1 Blishøne faldt.

Fulica atra. Kjels Nor 1.

17de December.

Anholt Knob. En Lomvie fandtes død paa Dækket om Morgenen.

Uria troile. Anholt Knob 1.

25de December.

Sprogø. N. 7. Ov. Sk. Enkelte Stære ved Fyret; 1 faldt.

Sturnus vulgaris. Sprogø 1.

27de December.

Blaavands Huk. Streng Frost. 4 Fugle faldt.

Sturnus vulgaris. Blaavands Huk 3.
Cannabina linota. Blaavands Huk 1.

Forskellige Iagttagelser fra Fyrene.

Graadyb Fyrskib. Januar: *5te* S.V. 2. Sk. En Hornugle opholdt sig ved Skibet en kort Tid om Formiddagen. *31te* fløj c. 50 Lærker mod N.Ø. om Form. — Februar: *27de* fløj en Flok Viber mod N.Ø. om Form. — Marts: *3dje* var c. 20 Stære og Lærker om Skibet. *5te* opholdt c. 10 Lærker, c. 20 Stære og nogle Viber sig omkring Skibet. *12te* opholdt en Flok Stære sig om Skibet om Form. *14de* fløj en Flok Stære mod N.Ø. om Efterm. *15de* opholdt nogle sig omkring Skibet. *22de* fløj Stære, Lærker, Krager og endel

Smaafugle mod N.Ø. om Efterm. *23de* opholdt en Flok Stære og endel Smaafugle sig omkring Skibet. — April: *12te* fløj endel Krager mod N.Ø.; et Par Stære ved Skibet det meste af Dagen. *13de* var en Flok Stære og Bogfinker paa Skibet om Dagen. *16de* fløj 3 Gæs om Morgenen mod N. — Juli: *23de* fløj c. 10 Stære i Flok mod S. om Morgenen. — Oktober: *20de* S.V. 1. Ov. fløj 45 Svaner i Flok mod S. *21de* var 2 Stære og 1 Bogfinke paa Skibet en Del af Dagen. *28de* fløj flere Krager mod S. *29de* var nogle Stære og 2 Bogfinker paa Skibet om Morgenen. — December: *28de* opholdt en Strandløber og 2 Stære sig ombord nogen Tid om Form. — Chr. Hansen.

Sædenstrand Fyr. Fra tidligt om Efteraaret til omkring 1ste April er her i tusindvis af Knortegæs, om Efteraaret og Vinteren store Flokke af Graaænder og Brunnakker og hele Aaret træffes baade den store og den lille Regnspove. — T. F. Saxtorph.

Vyl Fyrskib. Februar: *15de* var en Lærke ved Skibet. *23de* S.Ø. 3. Snetykning. Mange Lærker og enkelte Stære fløj forbi. *24de* fløj mange Lærker og enkelte Stære forbi Skibet. *28de* var enkelte Solsorter ved Skibet; Flokke af Gæs fløj mod Ø. — Marts: *2den* fløj 18 Svaner mod S.Ø. *7de* var enkelte Stære ved Skibet. *20de* enkelte Stære ved Skibet. *24de* var en Hornugle paa Skibet; den blev forfulgt af 3 store Havmaager, da den fløj. *25de* var en Raage ombord. — April: *12te* var endel Krager ombord. *17de* var mange Raager og Krager ved Skibet. *18de* var endel Stære og Raager ved Skibet. — Maj: *26de* fløj en Svale ved Skibet. — Juli: *4de* var en Svale ombord. *7de* kom en Stæreunge ombord. *21de* ligeledes. — Oktober: *16de* var en Ugle ved Skibet. *25de* fløj en stor Flok Vildgæs mod S. *27de* kom en Krage til Skibet. — November: *3dje* var 2 Krager og 1 Ravn ved Skibet; sidstnævnte spiste af de døde Stære og fløj først til Land den 4de. *9de* var en Krage og en Raage ombord; Viben saas og hørtes. — December: *4de* S.S.V. Sk. Nogle Viber saas om Dagen. — A. H. Schmidt.

Horns Rev Fyrskib. Februar: *12te* opholdt enkelte Stære sig paa og omkring Skibet. — April: *3dje* opholdt 1 Allike og enkelte Stære sig paa Skibet. *4de* ligeledes, fløj senere mod Land. *6te* opholdt enkelte Stære sig paa Skibet. *12te* trak store Flokke Krager forbi Skibet mod N.Ø. *13de* fløj store Flokke Regnspover

forbi Skibet. *17de* opholdt enkelte Stære sig paa Skibet. — Oktober: *28de* fløj flere Flokke af Stære forbi Skibet mod S.V. — November: *2den* trak store Flokke af Viber og Regnspover forbi Fyrskibet mod S.V. — Toftgaard Nielsen.

Lyngvig Fyr. Marts: *1ste* hørtes endel Viber og Strandskader. *7de* hørtes Regnspover og Ænder i Fyrets Nærhed. *13de* hørtes Regnspover, Viber og Strandskader. *27de* S.Ø. 2. Ov. D. 17 Svaner trak i Flok mod S. — April: *12te* hørtes Regnspover. — Oktober: *4de* fløj 40 Vildgæs mod S. — Efter Træktiden ses ikke faa beskadigede Stære og Drosler, der ikke kan flyve og derfor maa overvintre her. — C. A. Hansen.

Thyborøn Kanals Fyr. Marts: *9de* trak en Flok Viber mod N. — *22de* var 4 Strandskader ved Fjorden. — April: *13de* trak flere Flokke Krager mod N. *17de* trak en Flok Graagæs mod N. — *28de* trak flere Krager mod N. — Maj: *28de* trak mange Knortegæs mod N. — September: *19de* trak flere Flokke Knortegæs mod S. — Oktober: *15de* trak en Flok Knortegæs mod S. — I. C. Christensen.

Rubjerg Knude Fyr. Oktober: *4de* trak en Flok Graagæs forbi Fyret Kl. 5 Form. — C. V. Fiedler.

Højen Fyr. Intet Fuglefald. — A. T. Friis.

Skagen Fyr. Marts: *3dje* opholdt c. 50 Raager sig ved Fyret om Efterm. *7de* opholdt c. 12 Viber sig i Flok ved Fyret om Form. *15de* hørtes Lærken. — Maj: *3dje* saas Svalen. *17de* hørtes Gøgen. — Juni: *30te* opholdt en Stork sig fra Morgen til Middag i Engen ved Fyret. — November: *22de* saas 6 Svaner ved Solnedgang komme fra Nord og smide sig i Vandet Syd for Fyret. *24de* fløj 2 Svaner mod Øst. *25de* fløj 4 Svaner mod V. *26de* trak 9 Svaner mod S. — V. Christensen.

Nordre Rønner Fyr. Februar: *23de* opholdt en Vibe sig ved Fyret. — Marts: *4de* landede 10 Strandskader S. for Fyret. *17de* var 2 Gravænder paa Holmen. — April: *1ste* var c. 50 Gravænder paa Holmen. *28de* var endel Hættemaager ankommet til Rugepladserne paa Holmen. — December: *25de* trak endel Aalekrager mod N. — I de sidste 2 Aar er her af Fugle kun faldet 2 Lærker ved Fyret, da dette er et Vekselfyr. — O. Riis Jensen.

Læsø Trindel Fyrskib. — Marts: *16de* trak endel Krager

mod N.Ø. *24de* trak endel Krager mod N. *25de* opholdt 3 Stære og 1 Lærke sig ombord hele Eftm. *26de* opholdt 4 Skovduer sig ombord mellem Kl. 5 og 6 Form. — Oktober: *5te* opholdt en Vipstjert sig ombord om Form. *8de* fløj c. 30 Graagæs i Flok mod S. Kl. 8 Form. *20de* fløj 4 Graagæs mod Ø. Kl. 8 Form. *21de* fløj flere Flokke Krager mod S. i Dagens Løb. *26de* saas en Ugle Kl. 8 Form.; den satte sig et Øjeblik paa Lønningen; en Flok Krager samt mindre Flokke af Gæs fløj mod S. og S.V. i Løbet af Dagen. *28de* fløj Krager i hundredevis samt mindre Flokke Gæs mod S.V. i Dagens Løb. — November: *1ste* fløj flere Flokke Krager mod S.V. i Dagens Løb. *7de* fløj flere Flokke Krager mod S.V. paa Morgenvagten. — S. Winther.

Østre Flak Fyrskib. Februar: *11te* fløj 3 Vildgæs mod V. *21de* fløj en Flok Vildgæs mod N. — Marts: *16de* trak Krager enkeltvis mod N.Ø. *23de* trak Flokke af Krager mod N.Ø. — September: *16de* var flere Vipstjerter ved Skibet. — November: *9de* fløj 4 Svaner i nordlig Retning. — A. N. Kromann.

Anholt Knob Fyrskib. Marts: *17de* fløj flere Krager mod Ø. *23de* fløj mange Krager mod Ø. — April: *15de* fløj 12 Graagæs mod N.Ø. Kl. 4 Eftm. — Oktober: *15de* fløj en mindre Flok Krager mod V. — ligeledes en Flok Smaafugle. *20de* opholdt 8 Graaspurve sig om Bord fra Mdg. til Mørkets Frembrud. *21de* fløj 16 Stkr. Graagæs mod V. Kl. 7 Form. *31te* opholdt en Bogfinke sig ombord om Eftm. — November: *6te* fløj flere Krager mod V. — M. Trondal.

Anholt Fyr. Februar: *28de* fløj flere Flokke Krager mod N.Ø.; endel Vindrosler iagttoges om Dagen omkring Fyret. — Marts: *16de* saas Flokke af Krager flyvende mod N.Ø. Strandskaden saas paa Stranden. — April: *14de* saas store Flokke Alliker i Træk mod N.Ø. — I Juni og Juli iagttoges mange Ederfugle med Ællinger langs Stranden. — Oktober: *8de* var store Flokke Krager paa Øen. — M. P. Andersen.

Hesselø Fyr. Februar: *2den* saas Viben. *3dje* saas Stæren. — Marts: *16de* saas Strandskade og Gravand. — April: *11te* og *12te* opholdt en Stork sig paa Øen. — Maj: *8de* saas Svalen. — December: *6te* opholdt mange Sjaggere sig paa Øen. — K. A. Jensen.

Spodsbjerg Fyr. Intet Fuglefald. — P. Chrisensen.

Schultz's Grund Fyrskib. Marts: *3dje* fløj flere Lærker i østlig Retning. *4de* fløj mange Krager mod Ø. *23de* fløj mange Krager mod Ø. — April: *11te* fløj adskillige Flokke Ederfugle mod N. *12te* opholdt 2 Bogfinker sig paa Dækket til den følgende Dag; flere Flokke Krager fløj mod N. *14de* opholdt en Ugle sig paa Skibet en halv Time. *16de* opholdt en Bogfinke sig ombord til den *19de*, da den døde. — Juni: *27de* opholdt 10 Stære sig paa Skibet. *28de* hørtes nogle Regnspover af og til ved Solnedgang; 3 Stæreunger c. 2 Timer paa Skibet. — Oktober: *28de* fløj Flokke af Krager hele Dagen mod S.V. — December: *19de* fløj en Krage mod S. — E. Rasmussen.

Hjelm Fyr. Januar: *6te* saas en Lomvie paa Stranden; forekommer sjeldent her ved Øen. — Februar: *3dje* hørtes Lærken første Gang. *25de* saas den første Vibe. — Marts: *3dje* saas de første Stære. *16de* saas de første Strandskader paa Stranden. *20de* ankom de første Maager til Rugepladsen. *22de* saas de første Vipstjerter. — Maj: *3dje* saas de første Svaler. — Juni: *1ste*. For Tiden ruger Maager, Strandskader samt enkelte Viber og Skalleslugere paa Øens Lavland. — August: *29de* trak 22 Storke hen over Øen mod S. — September: *4de* trak 32 Storke hen over Øen mod S. — Oktober: *3dje* trak 2 Storke over Øen fra V. mod Ø. — December: *23de* fløj en stor Musvaage over Øen ved Middagstid. — H. A. H. Nielsen.

Vestborg Fyr. Februar: *10de* kom Viben. *26de* kom Stæren. — Oktober: *20de* trak c. 20 Svaner mod S.V. tæt forbi Fyret. — I første Halvdel af December saas af og til Stære og Lærker om Natten om Fyret. — Hele Aaret har endel Strandskader opholdt sig ved Kysten her. — Fra Oktober og Aaret ud er Ænder og Gæs set her i større og mindre Flokke, i Slutningen af December saas dog kun Ænder, men i større Flokke. — H. Tidemand.

Nordre Røse Fyr. Januar: Enkelte, undertiden 3—4 Ederfugle er i Løbet af Maaneden set ved Fyret. — Februar: *20de* til *21de* saas en stor Flok Ænder S. for Fyret. — December: *29de* fløj 5 Svaner over Fyret mod V. — H. S. L. Madsen.

Drogden Fyrskib. Februar: *16de* fløj c. 150 Smaafugle i Flok mod V. — Marts: *8de* trak Lærker af og til mod S.V. *13de* fløj 2 store Flokke Lærker mod S.V. om Eftm. *15de* fløj Lærker hele

Dagen kvidrende mod Ø.; en Flok Krager fløj mod N.Ø. *17de* fløj Krager jævnlig hele Dagen mod N.Ø.; 7 Svaner i Flok fløj om Form. mod N.Ø. *19de* opholdt en Flok Havlitter sig i Nærheden af Skibet. *23de* fløj Lærker jævnlig mod Ø. *25de* opholdt flere Bogfinker sig paa Skibet af og til. *26de* var Bogfinker og Stære ved Skibet. *27de* var et Par Bogfinker paa Dækket. *30te* var et Par Bogfinker paa Dækket om Eftm. — April: *21de* trak 17 Hejrer i Flok mod N. — Maj: *7de* opholdt nogle Gerdesmutter sig paa Skibet. — September: *6te* fløj c. 20 Vipstjerter omkring Skibet om Eftm.; fløj senere mod N.Ø. *7de* fløj en Spurvehøg mod N.V. Kl. 5 Eftm. *9de* fløj nogle Lærker mod V. om Morgenen. *19de* fløj 3 Aalekråger mod N.V. om Eftm. *27de* fløj flere Flokke Lærker og Vipstjerter mod N.V. *28de* opholdt 1 Bogfinke og 1 Vipstjert sig paa Skibet. — Oktober: *15de* opholdt enkelte Bogfinker, Fuglekonger og Stære sig paa Skibet. *21de* trak Flokke af Krager mod V. *28de* opholdt en Irisk sig paa Dækket. — November: *6te* opholdt 2 Bogfinker sig paa Dækket. *7de* fløj Krager mod V. hele Dagen; en Bogfinke ombord. *28de* fløj 5 Svaner mod S.V. — Jul. S. Jensen.

Refsnæs Fyr. September: Endel Ederfugle paa Revet ud for Fyret. — Oktober: *16de* trak endel Krager mod V. — November: En Mængde Ederfugle, Lysænder (Bjergænder) og Sortænder om og paa Revet. Daglig saas Krager flyvende mod V. — December: Lige før Jul og i Juledagene saas endel Stære ved Fyret. — Sv. Hansen.

Halskov Rev Fyrskib. Januar: *7de* var mange Flokke Ederfugle i Farvandet. *31te* ligeledes. — Februar: *5te* fløj enkelte Krager mod V. *6te* nogle Lærker ved Skibet. *9de* var flere Flokke Ederfugle i Farvandet. *28de* fløj flere Flokke Krager mod Ø. — Marts: *12te* mange Lærker om Skibet. *13de* fløj mange Krager mod Ø. *20de* fløj 2 Flokke Havlitter mod V. — April: *11te* var Flokke af Gæs i Farvandet. *16de* fløj en Flok Ederfugle mod V. *19de* mange Flokke Ederfugle i Farvandet. *23de* ligeledes. *28de* fløj en Stork mod V. — Juni: *10de* fløj 3 Skovduer mod V. — August: *5te* fløj en Flok Regnspover og en Ørn mod V. September: *11te* fløj en Flok Viber mod V. — Oktober: *5te* var 2 Flokke Ederfugle i Farvandet. *14de* fløj en Flok Graagæs mod V. *19de* fløj en Spurvehøg og flere Flokke Krager mod

V. *29de* fløj 1 Flok Graagæs og flere Flokke Ederfugle mod V. — November: *2den* fløj flere Flokke Krager mod V. — December: *28de* fløj 3 Svaner mod V. — I. C. Jensen.

Sprogø Fyr. I Ugen mellem Jul og Nytaar har der jævnlig om Dagen været ret store Flokke Stære paa Sprogø, søgende Føde ved Husene. — E. Haubirk.

Helleholm Fyr. Februar: *12te* saas Strandskaden. *20de* saas Gravanden. — Marts: *15de* kom Terner og Maager. — Intet Fuglefald. — P. Larsen.

Vejrø Fyr. Februar: *27de* saas Viben og Stæren omkring Fyret. — Marts: *17de* saas Lærken ved Fyret. — April: *3dje* saas et Gravande- og et Graaandepar under Kysten, søgende Reder. *10de* opholdt Storken sig nogle Timer paa Marken og trak derefter mod N.N.Ø. — Maj: *12te* hørtes Gøgen i Haven, en Sjældenhed her paa Øen. — December: *20de* til *31te* saas hver Dag store Flokke af Taffel- og Hvinænder samt Brunnakker; Svaner saas paa Træk, undertiden med kort Ophold ved Øen. Paa Øen yngler Spids-, Grav- og Graaand samt Maager og Viber. — E. M. Hansen.

Tranekjær Fyr. Intet Fuglefald. — R. Vielandt.

Taars Fyr. Intet Fuglefald. — W. Pedersen.

Albuen Fyr. Intet Fuglefald — H. C. Mogensen.

Strib Fyr. Marts: *12te* saas Stæren ved Fyret. — I første Halvdel af April trak flere Flokke Graagæs mod N. — Fra *15de* til *27de* September trak flere Flokke Graagæs mod S. — Intet Fuglefald. — M. Ungerskov.

Baagø Fyr. Intet Fuglefald. — N. J. Hansen.

Helnæs Fyr. Januar: *15de* ses Ederfugle i Farvandet. — Februar: *1ste* saas Stæren og Lærken sang. *18de* saas Strandskaden samt endel Solsorter i Hækkene. — Marts: *11te* Sne. Viben saas paa Marken. *15de* eftersaa Stæren Redekasserne. *29de* saas Gravænderne ved Kysten. — April: *3dje* saas Vipstjerten. — Maj: *5te* kom Svalen. *7de* saas de første Terner ved Stranden. — I hele Foraarstiden har der været usædvanlig faa Ederfugle og Dykænder i Farvandet i Forhold til de foregaaende Aar. Ligeledes har Kragetrækket været meget smaat; Kragerne har paa deres Træk de foregaaende Aar til Tider slaaet sig ned paa Markerne og i Strandkanten i Tusindvis, hvilket ikke har været Tilfældet i denne Trækperiode. — August: Der ses nogle faa Par Gravænder med Æl-

linger i Bugten N. for Fyret. Oktober: I denne Maaned, hvor der ellers plejer at ankomme endel Ederfugle, er der i Aar slet ingen. — November: Kun ganske faa Ederfugle og Dykænder ses. — December: I første Halvdel ligeledes; hen mod Jul, da Kulden tiltog, saas her endel Smaaflokke af Ederfugle, ligeledes nogle Flokke af Blaarygge. I Dagene mellem Jul og Nytaar saas en Flok Sjaggere. I hele Maaneden opholdt et Par store Musvaager sig i Fyrets Nærhed. Juledags Aften ved Tænding saas 10 Stære, der havde slaaet sig ned paa Taarnhatten. — S. P. Mortensen.

Skjoldnæs Fyr. Februar: *27de* saas 15 Viber ved Fyret Kl. 4^{30} Eftm. — April: *28de* saas Ladesvalen. — Oktober: *4de* trak 4 Graagæs over Fyret mod N. Kl. 10^{10} Form. *29de* trak en Flok Graagæs mod S.V. Kl. 10^{10} Eftm. — November: *9de* trak 7 Vildgæs mod S.S.V. Kl. 10 Form. — H. V. Würtz.

Christiansø Fyr. April: *15de* saas mange Vipstjerter, Bogfinker og Rødkælke paa Øen, ligeledes Krager, Skovduer og en enkelt Skovsneppe. — Maj: *5te* saas Svalen første Gang. — Oktober: *13de* opholdt mange Drosler sig paa Øen. — H. M. Hansen.

Hammeren Fyr. April: *13de* trak c. 100 Svaner mod Ø. *21de* trak c. 50 Storke mod Ø., senere mod N. — Oktober: *28de* trak c. 60 Gæs i Flok mod N.V. — A. M. Dam.

Dueodde Fyr. Oktober: *9de* saas 19 Graagæs Kl. 11 Form. trække mod S. *29de* trak 14 Svaner Kl. 9^{30} Form. mod S. — November: *16de* saas 6 Svaner og 4 Graagæs trække sammen mod S. om Form. — Fra midt i August til lidt hen i September opholdt 5 unge Storke sig i Fyrets Nærhed. — C. Liisberg-Poulsen.

Hestehoved Fyr. I hele Januar saas daglig store Flokke Havlitter i Farvandet. — I Februar og Marts var Flokkene mindre og i April saas kun smaa Flokke paa 5 til 20 Stkr., i Maanedens Slutning saas kun af og til enkelte Fugle, der forblev i Farvandet hele Maj Maaned. — November: *2den* viste 6 Havlitter sig igen; omkring d. *10de* trak daglig smaa Flokke paa 10—15 Stkr. forbi, omkring d. *15de* var Flokkene større, paa 15—50 Stkr., efter den *21de* og Aaret ud saas daglig meget store Flokke. — December: *24de* fløj 12 Svaner mod N. *25de* fløj 6 Svaner nord efter. *26de* laa 9 Svaner ud for Fyret

hele Dagen. Fra d. *27de* til d. *31te* laa 5—20 Graaænder i Havstokken. — J. Jensen.

Gedser Fyr. September: *16de* og *17de* opholdt 14 Storke sig paa Marken og fløj derefter mod S. — C. Madsen.

Gedser Rev Fyr. Januar: *19de* fløj 6 Svaner mod N.V. — Februar: *16de* fløj 3 Svaner mod N.V. — Marts: *24de* fløj c. 25 Krager mod S.Ø. *25de* fløj c. 200 Krager mod S.Ø. — Oktober: *22de* opholdt en Bogfinke sig ved Skibet *25de* fangedes en Musvaage levende og indsendtes til Zoologisk Have. — November: *3dje* fløj 8 Krager mod N.Ø. *7de* fløj 1 Flok Krager mod N.Ø. *10de* fløj 6 Svaner mod N.V. — December: *22de* fløj 4 Gæs mod N.V. *25de* fløj 12 Gæs mod Ø. og 3 Svaner mod N.V. *27de* fløj 10 Svaner mod N.V. — K. E. Skovgaard.

Meddelelser om mindre almindelige danske Fugle.

Procellaria pelagica.

En Stormsvale blev skudt i Lillebelt d. 25.2.1923, meddeler Conservator C. N. Windeballe.

Procellaria leucorrhoa.

En Stor Stormsvale fangedes levende paa Vandet i Kalvebodstrand d. 19.11.1893, meddeler Rentier Hans Pedersen, i hvis Samling Fuglen findes.

Puffinus anglorum.

En Skraape, en voksen Hun, blev skudt i Skagerak d. 18.9. 1912, meddeler Rentier Hans Pedersen, i hvis Samling Fuglen findes.

Puffinus gravis (= major).

En Storskraape, en Han, blev skudt c. 5.1.1926 i Lillebelt ved Fredericia, ovre under den fynske Kyst. Den erhvervedes af Præparator H. Madsen, der forærede den til Zoologisk Museum.

Det er første Gang, at denne Art er iagttaget i danske Farvande. Efter Hartert (Die Vögel der paläarktischen Fauna 1912—21. S. 1423) har Storskraapen, saavidt man ved, sine Ynglepladser i Atlanterhavets aller sydligste Del paa Inaccessible Island i Tristan da Cunha Øgruppen. Her ruger den i vor Vintertid, men ses ellers

aarlig i store Flokke i det nordlige Atlanterhav, bl. a. i Farvandene om Island og Færøerne.

Otis tetrax.

En Dvergtrappe blev skudt paa Maglebylille Mark paa Amager d. 21.9.1922, meddeler Rentier Hans Pedersen, i hvis Samling Fuglen er indgaaet.

Phalaropus fulicarius.

En Thorshane blev skudt i Lillebelt d. 12.12.1924, meddeler Conservator C. N. Windeballe.

Larus glaucus.

En Graamaage, en ung Han, blev skudt i Lillebelt d. 18.12. 1910; meddelt af Conservator A. Vindeballe.

Lestris pomatorhina.

2 Mellemkjover, unge Fugle, blev skudt i Lillebelt i sidste Halvdel af November 1925, meddeler Præparator H. Madsen.

Acrocephalus aquaticus.

En Vandsanger, en Han, faldt d. 2.10.1923 ved Skjoldnæs Fyr (sml. S. 490); det er 7de Gang, at denne her i Landet saa sjeldne Art er faldet ved danske Fyr.

Locustella fluviatilis.

En Flodsanger, en ung Hun, faldt ved Lyngvig Fyr d. 15.9. 1923 (sml. S. 487); kun 1 Gang tidligere er denne Art iagttaget i Danmark, idet et Individ faldt ved Stevns Fyr d. 5.9.1883 (I Jahresb. (1883). Ornis 1885).

Locustella nævia.

En Græshoppesanger faldt ved Lyngvig Fyr d. 15.9.1923 (sml. S. 487).

Fra Færøerne.

Sumbø Fyr. Marts: *1ste* til *4de* opholdt 8 Alliker sig i Nærheden af Fyret. *10de* viste nogle Snespurve sig ved Etablissementet. — Oktober: 4 Vindrosler opholdt sig ved Fyret i Midten af Maaneden. — November: *1ste* fangedes en Vandrikse ved Huset. *14de* N.V. 8. Ov. Sne. En Drossel *(Turdus iliacus)* fandtes død ved Hønsegaarden. *15de* N. 5. Sk. Omkr. 100 Spover kredsede om Fyret en Tid af Dagen; nogle Snespurve ved Eta-

blissementet. *16de* sad en Solsort paa Marken ved Fyret ved Tændingstid. *19de* var 20 Snespurve i Flok en Tid af Dagen ved Fyret. — December: *24de* opholdt en Solsort sig det meste af Dagen ved Huset. *27de* saas 4 Duer i nordlig Retning; en Falk saas V. for Fyret, jagende efter en gammel Ravn. — Større og mindre Flokke Stære har været set hele Aaret. — J. Jacobsen.

Nolsø og *Borin* Fyr. Intet Fuglefald. — D. Olsen.

Tofte Fyr. Intet Fuglefald. — S. Thorkildshøj.

Kalsø Fyr. Intet Fuglefald. — J. Clementsen.

26.—1.—1926.

Faunistiske og biologiske Bidrag til danske Simulier's Naturhistorie

af

Hj. Ussing, Randers, Danmark.

1925

(m. 10 Figurer og 1 Kort i Teksten)

(With an English summary)

Forord.

Gennem flere Aar har jeg anstillet biologiske Undersøgelser over danske Simulier navnlig i Gudenaaomraadet, 56^0 28' N. B.; 10^0 2' Ø. L. (øst f. Greenwich), og da jeg bor ret centralt netop i den Del af Jylland, hvor de største Angreb finder Sted, har det været mig muligt at følge Begivenhederne paa nært Hold.

I 1910 publicerede jeg et mindre Arbejde „Simulia-Myggene" [1]), hvis vigtigste Resultat var Konstateringen af talrige Larver fra Marts Maaned i Nørreaa ved Udløbet i Gudenaa (Dybde ca. 2 m). De toges ved Skrabning, og det var første Gang, Larver med Sikkerhed blev fundet i Nørreaa—Gudenaa i saa stor Dybde og i saa store Mængder.

Senere har jeg skrevet en Del populære Artikler i de lokale Blade, for ad denne Vej at henlede Landboernes Opmærksomhed paa den Fare, der truer det græssende Kvæg i Gudenaadalen om Foraaret. Dels gennem disse Artikler, dels ved personlig Henvendelse til Folk ude i Terrainet har jeg haft den Glæde at kunne bidrage til at redde ikke saa faa Dyr fra Ødelæggelse.

Men det var egentlig først i 1920, da „Det kgl. danske Videnskabernes Selskab" udsatte en Prisopgave: „En faunistisk biologisk Undersøgelse over vore Simulier", at jeg for Alvor tog Arbejdet op.

Jeg havde da ogsaa den Glæde, at min indsendte Besvarelse blev prisbelønnet. En anden Besvarelse af Dyrlæge Axel Petersen fik dog Hovedprisen, og den er i udvidet Form fornylig (1924)

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1) Flora & Fauna. 1910 København.

publiceret i Vid. Selskabs Skrifter, Række V. 4.: „Bidrag til de danske Simuliers Naturhistorie".

Paa Grund af, at jeg ikke havde Adgang til den vidtløftige og ofte vanskeligt tilgængelige Literatur, var det mig ikke muligt at levere en tilfredsstillende Systematik med rigtige Bestemmelser af alle de iagttagne Arter. I foreliggende Arbejde har jeg med Benyttelse af Axel Petersen's Systematik revideret mine Bestemmelser og publicerer her de Partier af min Besvarelse, som jeg anser for at indeholde faunistiske og biologiske Iagttagelser af Værdi.

De danner paa forskellige Punkter et Supplement til Axel Petersen's Undersøgelser, der for største Delen er udførte i ganske andre Egne af Danmark end mine og er desuden i mangt og meget behandlede ud fra andre Synspunkter.

Jeg bringer her „Videnskabernes Selskab" min ærbødige Tak for Belønningen. Ogsaa en ærbødig Tak til Professorerne C. Wesenberg-Lund og C. H. Ostenfeld for kritisk Gennemgang af mit Manuskript. Men ogsaa min varmeste Tak til Bestyrelsen for Nat. Forening, der overtog Publikationen.

Kap. I.

(Lokalitetsbeskrivelser).

De Lokaliteter, som vi hovedsagelig skal beskæftige os med i nærværende Arbejde, og som jeg særlig har undersøgt, er beliggende i Gudenaa-Omraadet (se Kortet p. 539).

Foruden den Del af Gudenaa, der ligger mellem Randers og Frisenvold, er Tangeaa ogsaa medtaget; ligeledes Nørreaa fra Aalum ud for Fussing Skove og ned til Udløbet i Gudenaa ved Fladbro. Endvidere Haslum-Skovbæk og Lilleaa, som afvander til Gudenaa ved Langaa.

Foruden paa disse Lokaliteter har jeg anstillet kortere Undersøgelser langs Gudenaa mellem Sminge og Tvilum; og helt uden for dette Vandomraade ved de bekendte kolde Kilder i Rebbild Bakker ved Skørping.

Efter de opnaaede Resultater mener jeg biologisk set at kunne gruppere mine Arter i Flod- eller Aaformer og de kolde Kilders Former, som jeg benævner Koldtvandsformer, og af disse to Grupper er Flodformerne langt de talrigste, de farligste, og de optræder tillige med de fleste Generationer.

Det indsamlede Materiale fra ovennævnte Lokaliteter fordeler sig paa 5 Arter. En Del af dem har jeg fanget, dels sværmende, dels i Kreaturernes Øren, men adskillige er klækket fra Pupper. Som bekendt lader dette sig let udføre udenfor Vandet — blot de ikke unddrages Fugtighed. Jeg benyttede udelukkende fugtigt Mos i mit Klækkebur. Ofte havde jeg flere saadanne Bure i Gang paa samme Tid, hvert indeholdende sin Art.

Vi vil nu behandle Materialet lokalitetsvis, og for bedre at forstaa det Milieu, Dyrene lever i, vil de forskellige Egnes Ejendommeligheder kortelig blive omtalt.

A. Gudenaa—Nørreaa.

Fra Nørreaa's Udløb i Gudenaa ved Fladbro og ned til Randers (se Kortet) — en Strækning paa ca. 5 km — kan vi dele Aaen i to Partier, hvis øvre Halvdel gaar i nordøstlig Retning og bestaar af ét stort Løb, hvorimod den nedre Del (altsaa nærmest Randers) løber ret i Øst og deles ved langstrakte Holme i flere Sideløb — det saakaldte „Delta". En udførlig Beskrivelse af Ran-

(fot.: A. Jensen)

Fig. 1. Gudenaa ved Randers. Findestedet for *Simulium argyreatum*.

ders-Dalen fra Fortid til Nutid, topografisk, geologisk, zoologisk og botanisk vil man finde i „Randers Fjords Naturhistorie" 1918 (A. C. Johansen).

Strømmen er noget forskellig i ovennævnte Parti af Aaen; de fleste Lokaliteter har rolig Strøm under normal Vandstand omend variabel efter Tidevandet, som altid mærkes helt op forbi Randers. Paa andre Lokaliteter baade i Hovedløbet og i Delta-Strømmene navnlig omkring Spidsen af Holmene løber Vandet noget kraftigere, og Bundforhold, Plante- og Dyreliv præges heraf. Slige Steder finder vi *Scirpus*-Associationer, som aldrig naar til at sætte Aks, men forbliver sterile; de smukke, grønne, submerse Blade flotterer i Strømmen. Det er ogsaa her, vi skal søge Simulierne (Fig. 1).

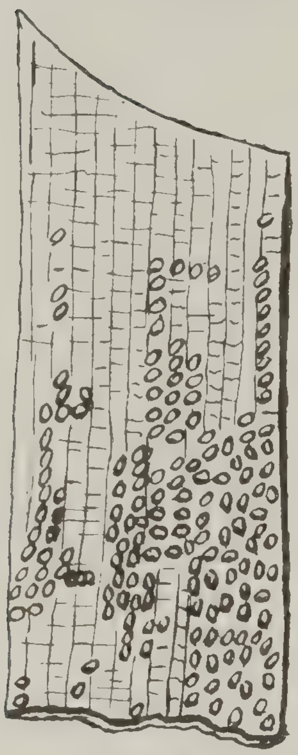

Fig. 2.
Æg af *S. argyreatum* »in situ« × 50.

Den dominerende Art — jeg tør kalde den for Karaktérdyret blandt Simulierne paa Gudenaa — er *Simulium argyreatum* (Mg.) Lundstr.[1])

Æg (Fig. 2) har jeg taget paa submers Scirpus 8. Juli tæt ved Nørreaas Udløb langs nordre Bred. De er ovale, 0,1 mm, gullige og aflagt meget uregelmæssigt — ofte i to Lag; det ser ud, som var de sprøjtet ud paa Bladene. Flere Forfattere omtaler Æglægningen hos Simulierne, Jennings and King, Horwath, Malloch, Edwards, Pomeroy og Axel Petersen. De ovenfor omtalte Æg er haardskallede, stærkt klæbende og lægges i Gelémasse, som hærdner lidt efter lidt.

I Løbet af kort Tid bliver de mørkere, og naar Klækningen nærmer sig, er de oftest ganske sorte.[2])

Jeg fandt næsten alle Belægninger af *argyreatum* paa Undersiden af den submerse Vegetation nær Overfladen; paa de dybere liggende Blade fandtes ingen Æg — derimod Larver, smaa og store, meterdybt, saa vel som paa Bunden.

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1) Edwards (1920) har fundet, at denne Art har Sæsondimorphisme. En Foraarsform (*v. sericatum* Mg.) og en Sénsommerform (*argyreatum* Mg). Axel Petersen (1924) har konstateret begge disse Former i Danmark.

2) Nogle Belægninger af *argyreatum*-Æg mangler Gelémassen. Ægget er i saa Tilfælde klæbet direkte til Bladet (baade gule og sorte Æg).

Bladet er brunt af en sammenhængende Ægmasse; en saadan Belægning kan ikke stamme fra én Hun, men fra flere Hunner. Æggene ligner, set med ubevæbnet Øje, sort eller brunligt Diatomeslam. Jeg har klækket en Mængde af denne Arts Æg hjemme i rindende Vand; sammenholdt med Undersøgelser fra Naturen kan jeg ansætte Ægstadiets Varighed til ca. 1 Uge. Ved Klækningen spaltes Ægget paa langs og ligner en sprængt Bælgkapsel.

Den spæde, nyfødte Larve, der maaler 0,5 mm, er i Habitus lig de voksne. Den er kun mere gennemsigtig og har et færre Antal Børster i Vifteorganerne. Den spinder straks sin Traad ud og bevæger sig hurtig af Sted paa Maalermanér.

De æglæggende Hunner gaar nødig dybt ned i Vandet, men holder sig til de flotterende Blade i Overfladen. Masser af nyklækkede Larver føres bort med Strømmen og fæstner sig dybere nede paa den underliggende Vegetation eller paa selve Bunden.

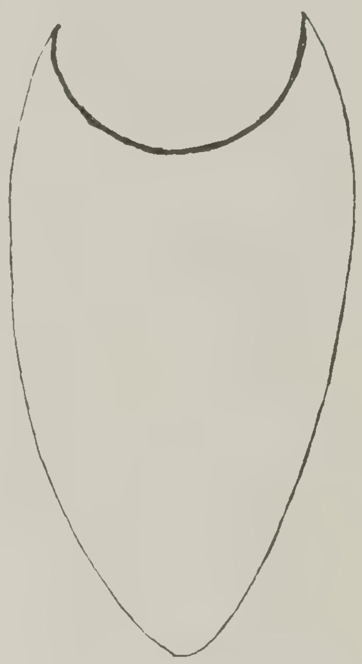

Fig. 3. Cocon af *S. argyreatum* × 50 (dorsal).

14. Juli var der endnu en Del Æg at se, men 25. Juli fandtes ikke flere. Nu havde de spæde Larver udbredt sig omtrent ned til 1 m, og en Del af dem var allerede vokset op til 6 mm. De havde tre ugrenede Blodgæller (Analgæller). Nogle faa Pupper (4 mm) var nu udviklet; 6 Trachétraade paa hver Side. Coconen almindelig tøffelformig med lidt fortykket Forrand (Fig. 3).

Pupper fandtes ikke blot paa *Scirpus*, men ogsaa paa *Sagittaria*, *Potamogeton lucens*, *perfoliatus* og *natans*.

I Deltaets Hovedløb („Paradisholmen“) fandt jeg 18. Juli talrige Æg — alle sorte og nær Klækning. I August iagttoges atter mange Æg tilligemed en Del Imagines i Sværm over Vandet. Paa $^1/_2$ m Dybde fandtes Larver og Pupper. Klækning gav f. Eks. 17 Stk. fordelt saaledes: $^2/_8$, 2 ♂ 1 ♀; $^3/_8$, flere ♂ og ♀; $^4/_8$ det samme o. s. v. Vi ser heraf, hvor hurtig Udviklingen gaar for sig paa denne Aarstid, og der produceres i gunstige Aar mindst to Sommergenerationer foruden For- og Efteraarskuldet.

Ved et Besøg paa Lokaliteten 3. Oktober fandt jeg hverken Æg, Larver eller Pupper, dog har der utvivlsomt eksisteret spæde Larver

dybere nede; thi 21. November, da al submers Vegetation var visnet bort, kom Larverne frem ved Skrabning paa 1,5 og 2 m. Størrelsen var 4 og 4,5 mm. De havde altsaa nu søgt Bunden for at overvintre. (V. Temp. + 1 ⁰ C.).

S. argyreatum udbreder sig op i Nørreaa paa de Steder, hvor Strøm og Vegetation passer den. Ud for Fussing Skove ved Aalum Bro (22. August) tog jeg talrige Pupper paa Potamogeton og Scirpus. Adskillige Scirpusblade var belagt med friske Æg — rimeligvis Sommerens sidste Generation, der nu forberedte Efteraarskuldet, hvis Larver overvintrer. Ved Klækningen kom 4 ♀, 1 ♂ ($^{24}/_{8}$); og de nærmest følgende Dage kom 4 à 5 Stk., mest Hunner.

Blandt Individerne af denne Generation iagttog jeg Copula i mit Klækkebur — iøvrigt den eneste Gang jeg har set det hjemme.

Ellers parrer Simulierne sig fortrinsvis i Luften, hvad jeg særlig har bemærket paa Lokaliteterne Lilleaa og Tvilum.

Det er aabenbart disse *S. argyreatum*-Sværme her fra Nørreaa, der under gunstige Forhold gør Egnen omkring Fussing usikker, og det var ogsaa her, de store Angreb fandt Sted 5. Mai 1914 med det Resultat, at 6 unge Tyre døde straks, og da Dyrlægen fra Randers naaede derud, fandt han 6 andre døende. Dyrene var oversaaet med smaa „Fluer“ særlig omkring Øjnene, Ørene og Anus — altsaa Simulier!

Undersøger vi Gudenaadalen længere ind i Landet mod Silkeborg, bliver Simulierne endnu talrigere. Jeg besøgte de Lokaliteter, der ligger mellem Sminge og Tvilum, 6. Juni 1920 og var saa heldig at træffe enorme Sværmdannelser fra den store Foraarsgeneration. Sværmene bestod næsten udelukkende af Hanner, hvoraf de fleste viste sig at tilhøre *Simulium equinum* (L.) Edwards, nogle *S. argyreatum*. Langs Vejen, der fører ud til Tvilum gamle Klosterkirke og som løber parallel med Gudenaa paa den østlige Side, holdt disse Sværme sig nogle faa Meter over Terrainet. Uden Overdrivelse kan Antallet anslaas til Millioner, uagtet det rimeligvis blot var Mai-Generationens Efternølere.

Vinden var denne Dag en vestlig svag Brise; derfor stod Sværmene over Hedevejen øst for Aaen. Hunner saa jeg ikke meget til i Sværmene. Inde paa de nærliggende Marker fandtes en Del Kreaturer, og det saas tydeligt, det var galt fat med dem; thi Ungkvæget baskede ustandselig med Hovedet, og Hestene væltede sig

paa Marken, gnidende Ørene mod Jorden. Ved at undersøge nogle af disse Dyr fandt jeg Ørene fulde af Hunner, hvis Bagkrop var udspilet af Blod.

Ørets indre Vinding saa slem ud; den var praktisk talt forvandlet til en Blodskorpe. Paa Yver og Genitalier saas ingen Simulier, og uagtet Angrebet ikke kunde kaldes dødeligt, pinte og plagede det dog de stakkels Dyr i den Grad, at Ædelysten var borte og Udseendet kendelig deprimeret.

Bestemmelsen af disse Hunner er ikke helt paalidelig, da de var saa blodplettede, men alt tyder paa, at det var *S. equinum* og *S. argyreatum.*

Det lykkedes ikke at erholde Pupper fra Aaen, saa godt som alt var tilsyneladende paa Vingerne.

I Randers-Dalen har jeg taget enkelte *S. equinum* ♂ paa Skærmplanter langs Aaen op mod Frisenvold. Pupperne har jeg aldrig fundet her. Det er *argyreatum*, som dominerer. Hunner af sidstnævnte har jeg nedbanket fra Elletræer ved Frisenvold saa sent som 10. Oktober 1922. Imago-Størrelsen varierer fra 2,0 til 3,5 mm, og Foraarsformen er den kraftigste. Iøvrigt anser jeg *S. argyreatum* for at være en decideret Flodform og én af vore farligste Arter. Øst for Randers i Fjordens indre Del, hvor Plante- og Dyrelivet endnu har Ferskvandskarakter, men hvor Vandet delvis er brakt, udvikles ingen Simulier.

B. Lilleaa.

Hvor Lilleaa passerer Laurberg og skærer Landevejen, der fører forbi Herresædet Bidstrup, begrænses Aadalen, dels af Krat og større Skov, dels af et kuperet Terrain, som veksler med Lyngbakker og Smaakrat — ret en vidunderlig Egn og tillige en udmærket Lokalitet for Studiet af Simulierne.

Paa visse Strækninger har Aaen stærkt Fald og fører kraftig Strøm. *Potamogeton*, submers *Scirpus*, *Sagittaria* og *Berula angustifolia* (ogsaa submers) trives godt. Hist og her findes smukke Pletter af *Batrachium fluitans.*

Langs Bredderne finder vi flere Steder *Phragmites* iblandet *Scirpus* og *Typha.*

Paa Billedet (Fig. 4) ses den ene af mine Lokaliteter taget øst

for Broen; Pletterne og de lyse Partier midtstrøms viser den flotterende Vegetation. Dybden er knap 1 m. Det andet Billede (Fig. 5) er taget vest for Broen og viser ligeledes her den stærke Strøm i Midterpartiet, omend Dybden er næsten 2 m.

Faunaen har en lidt anden Karaktér end i Gudenaa ved Randers. Det er, ligesom den danner en Overgang til Koldtvandsfaunaen,

(fot. A. Jensen).
Fig. 4. Lilleaa ved Laurberg. Den submerse Vegetation flotterende for Strømmen. Findestedet for: *Simulium equinum*, *Simulium ornatum*.

og den er analog med den Gudenaafauna, vi møder længere inde i Jylland i Egnen omkring Tange og nede ved Tvilum. Et interessant lille Bevis finder vi f. Eks. ved at træffe den ret sjældne Flue *Atherix ibis*, hvis Forekomst og Biologi jeg har iagttaget baade ved Tvilum og Lilleaa — derimod aldrig i Randers-Dalen.[1])

Den stærke Strøm, som Lilleaa fører, giver en sandblandet og stenet Bund, og disse Forhold præger i det store og hele Faunaens Karaktér.

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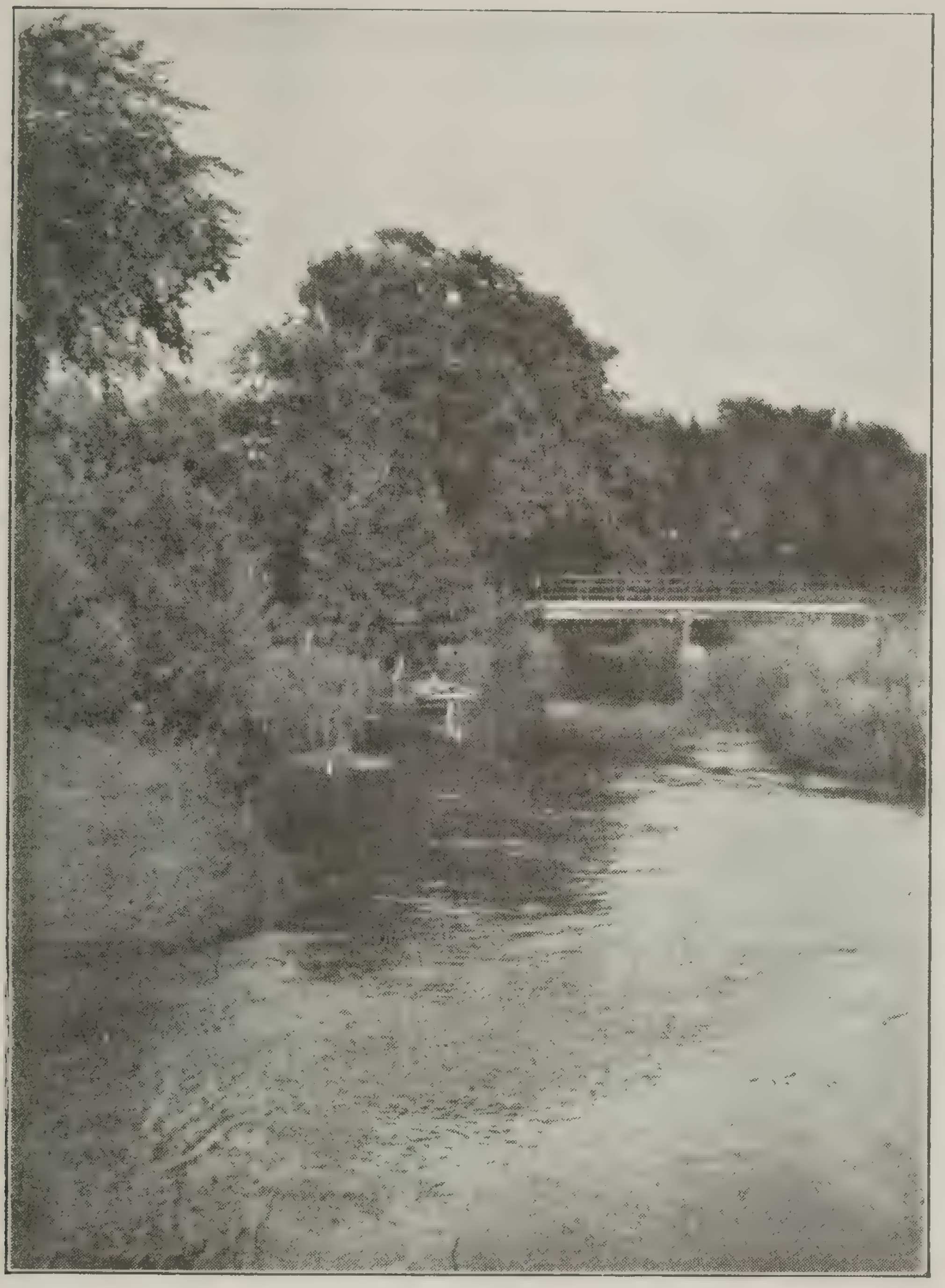
[1]) Flora & Fauna. II Hefte. 1924. København.

Simulierne optræder talrigt; to Arter klækkes paa Lokaliteten, og deres Larver og Pupper lever blandede mellem hinanden.

16. Mai 1920 Kl. 1 Eftm. havde vi en Lufttemperatur paa + 25 ° C. med svag Brise, og ca. 6 m fra Aaen paa den



(*fot. A. Jensen*).
Fig. 5. Parti fra Lilleaa ved Laurberg. (Vest for Broen).
Midt i Billedet ses den stærke Strøm.
Findested for Æg og Pupper af *Simulium equinum*.

sydexponerede Side stod store Sværme af Simulier i Læ af en Gruppe Graner og Fyrretræer. Der var baade Hanner og Hunner sammen, men Hanner i Majoritet, og i Aaen fandtes de tomme Pupper — mest paa Phragmites, som endnu ikke var vokset op over Vandspejlet.

Disse Sværme bestod af to Arter, nemlig *S. ornatum* Mg. og *S. equinum* (L.) Edw.

Senere paa Eftermiddagen iagttog jeg et Angreb paa en Hest. Den græssede i Engen umiddelbart op til Aaen, og den var meget medtaget. Ørerne var fulde af Blod og Skorper samt de kendte ophøjede Knuder, og de Hunner, jeg fik ud, var alle blodfyldte med ballonformig udvidet Bagkrop. Der var baade *equinum* og *ornatum* ♀.

24. Mai Kl. 1—4, L. Temp. $+ 26^0$ C., Vand $+ 17^0$ C. Denne Dag stod tætte Sværme af *S. ornatum* lige over Vandspejlet i hidsig kredsende Flugt paa en Strækning af ca. 10 m, men kun over de Steder, hvor Vandet gik med stærk Fart. Ikke én eneste Simulium holdt til over de rolige Arealer. Sværmene bestod af begge Køn, og Copula iagttoges i Luften. Adskillige Hunner var ifærd med Æglægning og benyttede nu hovedsagelig de Græsstraa, som fra Bredden berørte Vandfladen. Æggene afsattes i store, uregelmæssige Kager paa Undersiden — ganske som hos *S. argyreatum* fra Guden- og Nørreaa. En Mængde Hunner aflagde Æg paa samme Plante. Slimmassen, som indesluttede Æggene, var gullig, men betydelig kraftigere og mere opsvulmet end hos *argyreatum*.

Hvilken af Arterne, disse Æg tilhørte, kunde jeg ikke holde Rede paa — rimeligvis dem begge.

Det samme Billede iagttoges 15. Juni, men nu fandt jeg ogsaa Sværmdannelser flere km borte fra Aaen, dels i Skoven, dels langs Jernbanelinien samt over nogle langt bortliggende Hedebakker.

Alle disse Sværme bestod af Hanner, og der var Repræsentanter for begge Arter.

Vi har nu set den store Foraarsgeneration fra Lilleaa paa Vingerne.

4. Juli besøgte jeg atter Lokaliteten, og Vegetationen var nu vokset stærkt op. Alle submerse Planter var dækket med Tusinder og atter Tusinder af Larver og delvis Pupper. Larverne fandtes i alle Størrelser lige fra 3 mm til 8 mm, og paa den flotterende Scirpus var aflagt Ægmasser. Pupperne bestemte jeg til *S. ornatum* og *S. equinum*; de fandtes mellem hinanden, endog begge Arter paa samme Blad; paa sine Steder var de ordnede i zirlige snorlige Rækker — alle i Strømmens Retning.

S. ornatum-Puppen har otte Trachétraade paa hver Side og naar 5 mm. Trachèerne er af samme Længde som Puppen. Coconen er lignende *S. argyreatum's* i ydre Form, men alle Rande er tydelig fortykkede.

Puppen til *S. equinum* (Fig. 6) er særlig interessant og besidder 15 korte, tykke, rørformige Trachégrene, arrangeret saaledes, at de to Hovedstammer smyger sig dorsalt og ventralt omkring Coconen's og Puppen's Forrand, og fra den ene udgaar otte Grene, fra den anden syv (Fig. 7).

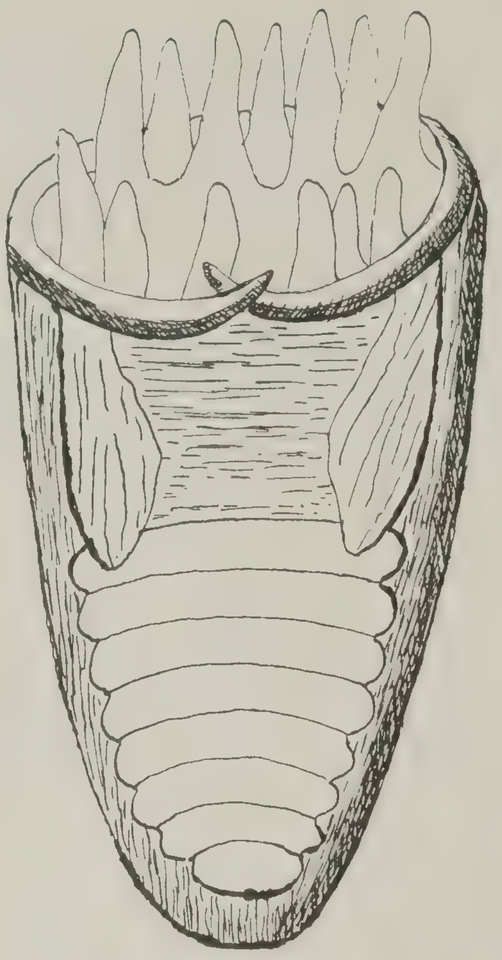


Fig. 6. Habitusbillede af Puppen til *S. equinum* × 50.

Denne Dag stod talrige Sværme over Vandet og parrede sig i Luften. Hunnerne saa jeg dykke ned i Vandet nu og da. Af det hjembragte Materiale klækkedes $^5/_7$ den første *equinum* ♂, $^6/_7$ en ♀, $^7/_7$ ♀ ♀; og $^6/_7$ og $^7/_7$ *ornatum* ♂ ♀ ♀.

Vi ser heraf, hvor hurtig Udviklingen gaar for sig paa denne Tid af Aaret. Fortsatte Observationer paa Lokaliteten gav følgende Resultater:

11. Juli: Masser af Larver i alle Størrelser samt Pupper af begge Arter tilligemed Imagines (begge Køn) over Vandet og langs Bredderne.

8 August: Stadig mange Larver og Pupper, enkelte tomme Coconer, ingen Sværmdannelser, ingen Æg. Inde paa de nærliggende Marker bemærkede jeg, at Faarene var plaget af Stik, de væltede sig paa Jorden for at gnide Ørerne. Ved Ejerens Hjælp lykkedes det at pille *S. equinum* ud af Ørerne. Samme Dag stod langs et Krat i Læsiden ca. $^1/_4$ km fra Aaen vældige Sværme — udelukkende *ornatum*-Hanner.

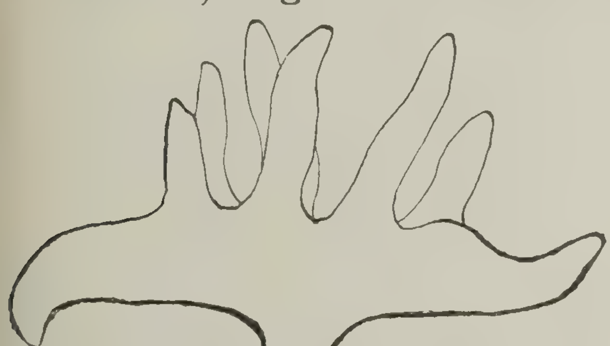


Fig. 7. Pupperør af *S. equinum* × 50 (lateralt).

12. August: Samme Situation i Aaen af Pupper og Larver.

15. August: Det samme Billede, dog lidt flere Pupper.

29. August: Det samme Billede, Tusinder af Larver og endnu flere Pupper.

26. September: Samme Resultat som 29. August.

I Oktober besøgtes Lokaliteten ikke.

I November naaede jeg atter derud, og der fandtes et ganske andet Billede. Vandets Temp. var kun + 4 ° C. (Luft + 8 ° C.). Vegetationen var begyndt at visne, dog stod endnu en Del Potamogeton og Scirpus flotterende i Strømmen, og overalt paa disse Planter samt paa Bunden sad Larver i Mængde. Derimod fandtes ingen Pupper.

Vifterne, som ellers plejer at være udfoldet, var nu mest sammenfoldet, og de Forsøg, jeg anstillede, dels paa Stedet, dels i Akvariet, bekræftede dette og bestyrkede min Formodning om, at Larverne paa denne Aarstid i den lavere Temperatur ikke er saa ivrige efter at fange Føden. Tarmen indeholdt ogsaa kun meget lidt Detritus. Larvernes Størrelse svingede fra 1—1,5—3,5 og 5 mm.

12. December. V. Temp. ÷ 0,5 ° C. (Luft Temp. 0° C.): Den submerse Plantevækst stod delvis endnu, men havde sænket sig dybere ned i den stærke Strøm; Vandstand normal, Bredderne snedækte.

Talrige overvintrende Larver fra 2—4—7 mm. Sammenlignet med Maalene fra 7. November vil det ses, at Væksten er gaaet lidt frem. Pupper fandtes ikke.

16. Januar 1921 foretoges den sidste Ekskursion for at afslutte Vinterundersøgelserne.

Luft Temp. ved Middagstid var ÷ 1,5 ° C. og Vandets ÷ 1 ° C. Inde langs Bredderne havde der dannet sig et tyndt Isdække, men iøvrigt var Vandet aabent i alle Strømpartierne.

Scirpus-Vegetationen var nu helt borte, og de overvintrende Larver havde anbragt sig dels paa Bundmaterialet, dels paa nogle Kvadratmeter store Bevoksninger af submers *Berula angustifolia* (*Sium*), hvis friske grønne Blade sikkert holder sig Vinteren over.

Blandt Larverne fandt jeg følgende Vækststørrelser: 3, 4,5, 8 og 8,5 mm.

Der var atter sket en lille Fremgang i Vækst, ca. 1 à 1,5 mm siden 12. December 1920.

Vi kan altsaa fastslaa, at Simulierne i Lilleaa forbliver i Larvestadiet med meget langsom Vækst Vinteren over. Begge Arter producerer flere Sommerkuld, der udvikles hurtigt (*equinum* de fleste), maaske fire, men dette afhænger for en stor

Del af Temperaturen. Sommerkuldene bestaar gennemgaaende af mindre Individer end Foraarsgenerationen, der her fra Lilleaa kan være usædvanlig kraftig.

S. equinum varierer i Længde fra 2,5—3,5 mm. *S. ornatum* fra 2,5 til omtrent 5 mm. Begge Arter hører til vore farlige Simulier.

S. equinum er decideret Flodform, men optræder ogsaa talrig i Aaer. Biologisk set har den meget tilfælles med *argyreatum*, selv om den maaske næppe kan regnes for slet saa farlig.

S. ornatum er mere eurytherm m. H. t. Opholdssted, idet den baade kan være Flodform, men ogsaa kan findes i kolde Skovbække (se pag. 531). Mest ynder den de Lokaliteter, som vore større Bække og mindre Aaer byder paa.

Om *S. argyreatum's* Forekomst i Lilleaa, kan jeg ikke udtale mig med Bestemthed; jeg har taget nogle Pupper, der tilhørte denne Art, men de kunde ikke klækkes, da de var indtørrede, fordi *Phragmites*, hvorpaa de sad, var vokset saa hurtig op over Vandspejlet, at Imago ikke naaede at udvikles. Det er meget sandsynligt, at Arten i hvert Fald findes i Lilleaa's nedre Del, nær Gudenaa.

C. Tangeaa.

Efter de Simulium-Angreb, der fandt Sted paa Højbjerg i 1920, besluttede jeg at undersøge den nærliggende Tangeaa fra Udløbet i Gudenaa og et Stykke mod Vest ind mod Rødkær.

Lokaliteten viste sig ogsaa at fostre Mængder af Simulier. Aaen har stærkere Strøm end Gudenaa, og Bunden er stenet og sandblandet. Lokaliteten er i faunistisk Henseende nærmest beslægtet med Lilleaa og kan altsaa siges at danne en Overgang til de kolde Bækkes Fauna.

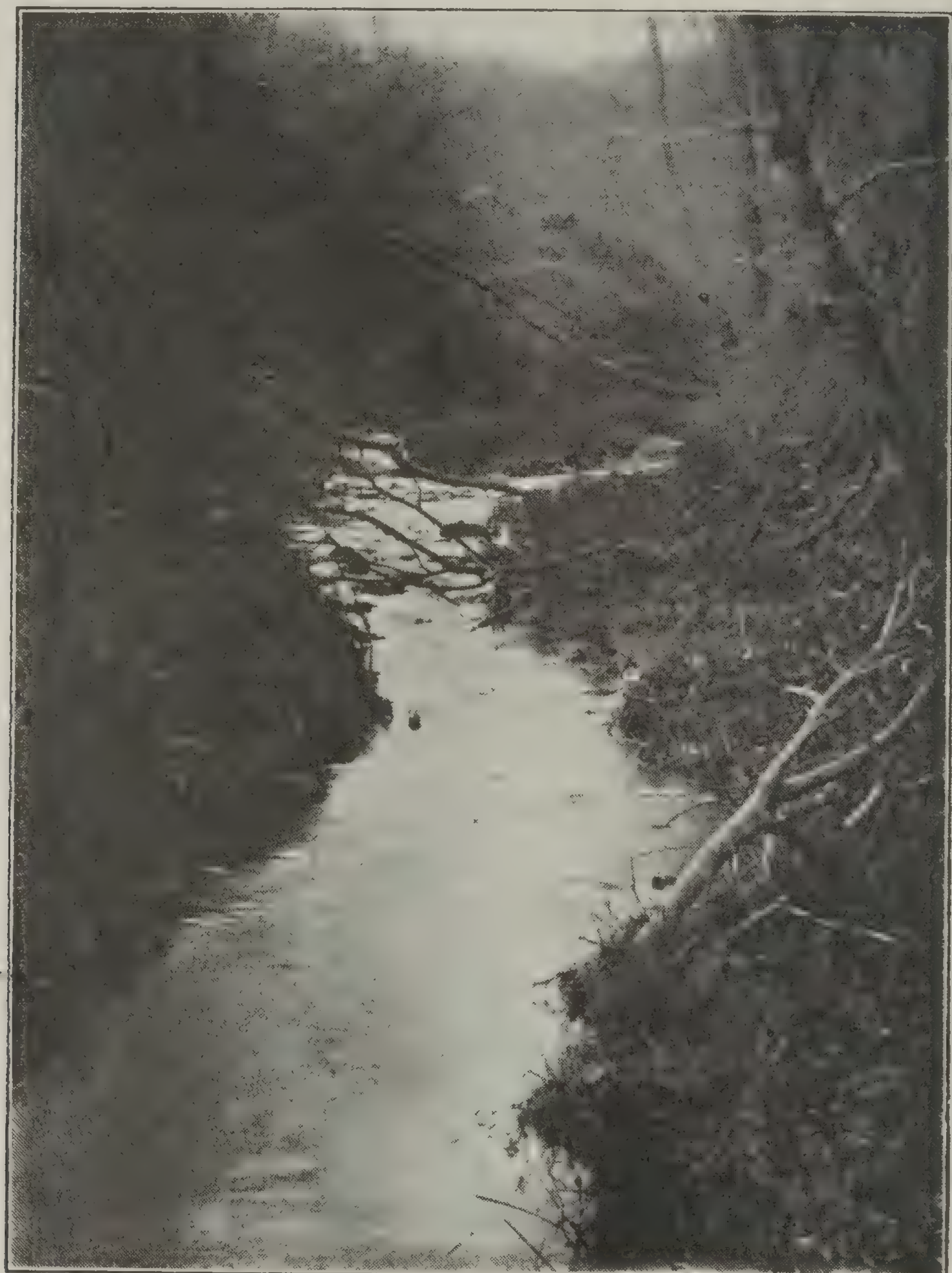
Mængder af submers Vegetation optager store Dele af Aaen og afgiver fortrinlige Ynglepladser for Simulierne, saa det er utvivlsomt herfra, at Sværmene bragte Ødelæggelse over Kreaturerne paa de omliggende Enge.

S. ornatum Mg. var Karaktérdyret. Jeg kunde ikke konstatere andre Arter paa det undersøgte Areal.

Materialet blev klækket, ♂♂ 7/8, ♀♀ 10/8. Hunner i Majoritet.

D. Haslum-Skovbæk.

Ca. 7 km syd for Randers ligger det lille smukke Haslum-Krat, en gammel Skovrest, som vistnok næppe har været under forstmæssig Kultur, og som derfor er nok saa interessant for Botanikeren og Zoologen. Skoven gennemstrømmes i sin nordlige Del af en lille Bæk (Fig. 8 og 9), som i de fleste Partier af sit Løb baner sig Vej gennem stejle Kløfter, dannende smaa Vandfald flere Steder. I Foraarstiden fører den ikke saa ringe Vandmængde, men om Sommeren kan den under regnfattige Perioder næsten tørre helt ud.



(fot. A. Jensen).
Fig. 8. Parti fra Haslum-Skovbæk.
Findested for *Simulium latipes* og *Simulium ornatum*.

Der lever to Simulium-Arter i denne Skovbæk, og de optræder ikke i noget stort Antal og ikke i hele deres Udvikling til samme Tid. Den ene er *S. latipes* Mg., den anden er *S. ornatum* Mg.

Puppen hos *latipes* er meget afvigende fra de allerede beskrevne Typer's; den maaler ca. 4 mm, er kraftigere og bredere. Coconen er skjoldformig (Fig. 10) og dorsalt forsynet med et stort, lidt buet Horn, der rager lidt fremefter midt imellem Trachéstammerne, som

Fig. 9. Parti fra Haslum-Skovbæk. *(fot. A. Jensen).*
Findested for *Simulium latipes* og *Simulium ornatum.*

kun har fire Traade paa hver Side. Saavel Larver som Pupper findes kun i de Dele af Bækken, hvor mindre Vandfald dannes, og sidder alle under Stenene eller paa nedfaldne Blade eller Pinde, der er klemt fast slige Steder. Anbringelsen af Pupperne er lidt forskellig i Forhold til Strømmens Retning; paa visne Blade sidder de i Strømretningen, men jeg har ofte fundet dem i afvigende Stillinger, navnlig i Stenenes Hulheder og under Stene. Æggene aflægges under Stene i Bækkens Bund; jeg har kun fundet ganske faa; de er lysegule og kittede sammen i Kager, men ikke i noget geléagtigt Sekret. Hunnerne maa entre ned langs Stenene under Vandet for at faa dem aflagt.

At disse Æg paa denne Lokalitet eventuelt kan taale en Indtørring, føler jeg mig forvisset om.

S. ornatum viser ved sin Optræden i denne Skovbæk at være i Besiddelse af en ikke ringe Tilpasningsevne — vi kender den jo hyppigst som Flod- og Aaform med flere Generationer; her er den Koldtvandsform — rimeligvis kun med én Generation — og danner et Led i den rheophile Fauna.

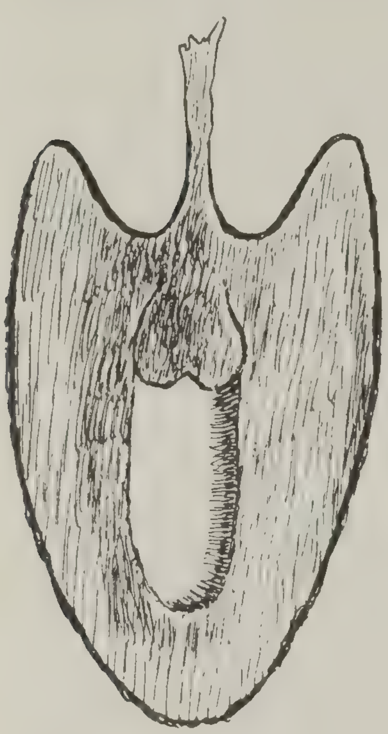


Fig. 10. Cocon til *S. latipes* × 40 (ventral).

Disse to Arters Vækstperioder ligger ikke paa samme Tid her i Skovbækken. Jeg har derfor udført regelmæssige Maalinger for at vise Larvernes Vækst samt Puppehvilens Varighed under de forskellige Temperaturforhold. Disse Maalinger er for at lette Oversigten sammenstillet i Tabellen pag. 533.

Resultatet bliver, at *S. latipes* har sin Larvetid fra November til April. Imago har jeg klækket 31. April og fundet den i Naturen indtil medio Mai.

S. ornatum er derimod senere paa Færde; først omkring 26. Juni viste disse Pupper sig og gav Imagines i Dagene mellem 1. og 4. Juli. Endvidere giver Skemaet et Overblik over Larvernes Udvikling under forskellige Temperaturer, og vi faar her Bekræftelse paa, at Væksten stagnerer ved lav Temperatur — altsaa om Vinteren.

S. latipes-Larvens Vækst tager egentlig først Fart henimod Slutningen af Marts, og ved den Tid opnaar den ogsaa sin normale Størrelse. Denne Arts Larver træffes dels enkeltvis, dels i smaa Selskaber paa 10—12 Stk., hyppigst færre og tidt meget spredt.

Paa dette Stadium (nær Puppetiden) er Larvernes Stofskifte vel nok mest udviklet. Gennem Forsøg ude i Naturen paa Larver holdt i Glas var det interessant at se dem udstøde en Del mørkebrune Ekskrementkugler (0,3 mm) med stor Kraft og i Løbet af faa Minutter. Den mikroskopiske Undersøgelse af disse Kugler viste organisk Detritus samt ikke saa faa Diatoméer.

Det er almindelig antaget, at Vifteorganerne er Simulium-Larvens fornemste Fangapparat, og det er utvivlsomt ogsaa for en stor Del Tilfældet, men det udelukker ikke, at Larven, som er meget mobil,

Dato	Temp. Luft Celsius	Temp. Vand Celsius	Art	Larve	Puppe	Imago	Haslum-Skovbæk. Bemærkninger
1920 17. Januar	0°	÷ 1°	*(Simulium) latipes*	3 mm	0	0	
29. Februar	+ 10°	+ 6°	*latipes*	5—6 mm	0	0	
			ornatum	3 mm	0	0	
14. Marts	+ 5°	+ 3°	*latipes*	5—6 mm	0	0	
			ornatum	3 mm	0	0	
21. Marts	+ 9°	+ 8°	*latipes*	6—8 mm	0	0	
			ornatum	4 mm	0	0	
28. Marts	+ 9°	+ 7°	*latipes*	7—8 mm	0	0	betydelig sværere i Kroppen end Februar-Larverne.
			ornatum	5 mm	0	0	
4. April	+ 8°	+ 7°	*latipes*	7,5—8 mm	4 Pupper	0	Pupperne var friske, men muligvis var der flere.
			ornatum	5 mm	0	0	
11. April	+ 8°	+ 6°	*latipes*	9 mm	flere Pupper	0	Puppens Længde er 4 mm, Kokonens Totallængde er 7 mm
			ornatum	6 mm	0	0	
31. April	+ 10°	+ 8°	*latipes*	9 mm	flere Pupper	2 ♀	Disse Hunners Klækning iagttoges paa Lokaliteten.
			ornatum	ingen	0	0	
9. Mai	+ 18°	+ 8°	*latipes*	ingen	flere Pupper	1 ♀	adskillige tomme Kokoner.
			ornatum	6—7 mm	0	0	
13. Mai	+ 20°	+ 12°	*latipes*	ingen	faa Pupper	1 ♀	flere tomme Kokoner.
			ornatum	6—7 mm	0	0	
16. Mai	+ 27°	+ 11°	*latipes*	ingen	faa Pupper	1 ♀	næsten alle Kokoner tømte.
			ornatum	7 mm	0	0	
23. Mai	+ 23°	+ 13°	*latipes*	ingen	faa Pupper	1 ♂ 2 ♀	klækket 25/5 og 28/5.
			ornatum	8 mm	0	0	
26. Juni	Temp. maaltes ikke	Temp maaltes ikke	*(Simulium) ornatum*	ingen	faa Pupper	♂ ♂ ♀ ♀ ♀ ♀	klækket 1/7 og 3/7.

ogsaa ved Hjælp af sine Kæber og Mandibler skraber Føde til sig af det Slam og Detritus, der dækker Sten og Planter. Jeg har selv overtydet mig derom, set det baade i Naturen og i Akvariet, og jeg tror heller ikke, det klare rindende Vand — navnlig i Skovbækken — indeholder tilstrækkelig Plankton og Detritus til Ernæringen under den stærke Vækst, som foregaar i de sidste Stadier.

Normalt tror jeg kun der udvikles én Generation aarlig i Skovbækken af begge de nævnte Arter, da det slet ikke har været mig muligt at konstatere Sommerkuld.

Først omkring 31. Oktober begyndte atter spæde Larver at vise sig, og disse maa absolut overvintre. De opnaar en Størrelse af ca. 2 mm ifølge mine Undersøgelser af 28. November, og dette Maal holder de indtil medio Januar under en Temperatur, der svinger omkring 0.

I det hele optræder *S. latipes* ret sjælden, og jeg har den kun fra Haslum-Skovbæk, hvor den langt fra kan siges at være individrig. Det samme gælder om *S. ornatum* her i Skovbækken.

Supplerende biologiske Undersøgelser i 1921 bekræftede de i Tabellen opførte Vækst- og Tidsangivelser for disse to Arters Liv i Haslum-Skovbæk.

E. **Rebbild-Bakker.**
(Ravnkilde).

For yderligere at underbygge min Opfattelse af Simuliernes biologiske Gruppering fra Øst- og Midtjylland i Flod- og Koldtvandsformer, anstilledes nogle Undersøgelser paa en anden „kold" Lokalitet, nemlig Rebbild-Bakker ved Skørping, et Parti af den jyske Landryg; se iøvrigt: Esben Petersen: Eine Reliktfauna der kalten Bäcke und Flüsse des Landrückens des mittleren Jütlands".[1])

Ved Foden af Rebbild-Bakker ligger Ravnkilde — vistnok Danmarks mest enestaaende Kildevæld. Selve Kilden eller rettere Kilderne dækker et betydeligt Areal, og Vandet, som risler og bobler op fra utallige Væld, har gravet hele Bakkeskrænten bort og derved jævnet sig dette store flade Areal, for tilsidst at forenes i en bru-

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[1]) Internationale Revüe der gesamten Hydrobiologie und Hydrographie. Leipzig. 1914.

sende Strøm, der baner sig Vej tværs over Stien ved Bakkens Fod og afvander til Lindenborgaa.

Hele denne mægtige Kilde er omkranset af rig Vegetation, men selve Bunden er fast og dækket af hvide, rene Sten, hvorover Vandet risler (ca. 4 cm Dybde) samt delvis bevokset med yppige Fontinalispuder.

Vandets Temperatur naar sjælden op over ca. $+ 7^0$ C., og den holder sig næsten konstant hele Aaret igennem.

Under disse Sten og i Fontinalistæpperne gemmer sig en ejendommelig rheophil Fauna. Ved mit Besøg i September sad talrige Simulium-Larver paa Stenene, og end ikke i den mest brusende Strøm søgte jeg dem forgæves. Larverne var omtrent alle udvoksede; adskillige havde forpuppet sig.

Der var to Arter Pupper, de fleste med otte Trachétraade, et mindre Antal med fire. De første gav ved Klækning *S. ornatum*; de sidste, som i det hele taget var ret sjældne, viste sig at være *S. costatum* Friederichs.

Den første *ornatum* ♂ klækkedes 13. September, derefter kom tre Hunner 14. Sept., og endnu en ♂ d. 16. Sept. Dette var altsaa Individer af Efteraarsgenerationen, der producerer de Æg, som overvintrer i Larvestadiet og giver Foraarsgenerationen i April.

De fleste af Pupperne til *costatum* var allerede tomme, og jeg naaede kun fra denne Ekskursion at klække én eneste, som gav en stor ♀ (20. September).

Hannen tog jeg paa Lokaliteten, just som den kom op fra Vandet. Begge de omtalte Arters Larver havde tre ugrenede Analgæller.

Vi ser altsaa, at R a v n k i l d e s Simulium-Fauna er delvis analog med Koldtvandsfaunaen i H a s l u m.

S. ornatum optraadte paa begge Lokaliteter, og *S. latipes* fra Haslum remplaceres i Ravnkilde af en anden Koldtvandsform, nemlig *S. costatum,* hvis Pupper ogsaa har fire Trachétraade, men mangler Hornet paa Coconen. *Costastum*-Puppen er iøvrigt temmelig stor, ca. 5 mm; dens Trachéer naar omtrent samme Længde. Coconen er slank, tøffelformig, glat og fin spunden, uden Horn, men med fortykket Forrand. Imago hører ogsaa til vore største Arter (5 mm).

Kap. II.

Simulierne som Skadedyr og Kampen imod dem.

Simulierne er fortrinlige og udholdende Flyvere i begge Køn, hvilket ikke mindst bidrager til Omfanget af den Skade, de i Virkeligheden anretter blandt Kreaturerne.

Selve Flugten er yndefuld, og der høres ingen Tone som hos mange andre af vore Myggearter. Med lidt Øvelse kan man let kende dem paa Flugten; de staar ofte næsten stille i Luften, pludselig daler de, stiger atter — noget lignende Døgnfluerne — men afbryder denne svævende Flugt med større eller mindre iltre B·ıer horizontalt i Luften. Dette kan undertiden foregaa i timevis. Sommetider afbrydes denne Dans brat ved, at Flokken ganske pludselig forsvinder.

Vi ved jo, der dannes Sværme, som væsentlig menes at bestaa af de blodsugende Hunner, og vi véd ogsaa, at Vinden er en mægtig Faktor ved Udbredelsen af disse Sværme, men hvorledes da med Hannerne? Hannerne deltager ogsaa i Sværmdannelsen, kun ikke altid paa samme Maade. Jeg har iagttaget begge Køn sammen i store Sværme i Mai. Paa samme Lokalitet i August kun Hanner i Sværm. Paa en anden Lokalitet i Mai kun Hanner i Sværm og paa en tredie Lokalitet i Juni overvejende Hanner og kun faa Hunner i Sværm.

Vi ser altsaa, der foregaar Sværmdannelser af begge Køn til de forskellige Tider om Foraar og Sommer, og disse Sværmdannelser betinges af nogenlunde roligt og varmt Vejr — en let Brise helst med Sol og en Temperatur omkring ca. 20 ^{0} C.

Koldt Vejr med Regn og Storm giver ingen Sværme. Dermed være ikke sagt, at Simulierne ikke sværmer ved lavere Temperatur og i skyet Vejr, men de rigtige store Sværmdannelser møder vi næppe under disse Forhold. I daarligt Vejr har jeg set Hanner opsøge Skærmplanters *(Sium)* Blomster og Hunner skjult i Mursprækker og lignende Steder. Hanner kan dog ogsaa træffes i Planterne til andre Tider, idet de synes nu og da at ernære sig af Blomsterhonningen.

Slutningen af April samt Mai maa anses for at være den Tid, hvor de største Sværmdannelser foregaar, og det kan ogsaa fastslaas, at de fleste Dødsfald blandt Kvæget sker i disse to Maaneder.

Der rejser sig nu det nærliggende Spørgsmaal: Hvorfor dør Kreaturerne netop i Mai og ikke eller da yderst sjælden i Juni, Juli og August? Hertil kan anføres to Aarsager.

For det første er Foraarsgenerationen talrig og saare blodtørstig. Stiger Temperaturen pludselig op imod 18—20 ^{0} C., hvad den hyppig gør i Gudenaadalen i Mai, frigøres umaadelige Mængder af Imagines næsten samtidig, og i det gunstige Vejr bliver der straks Sværmdannelser. For det andet er Kvæget paa denne Aarstid nylig sat ud; det er derfor blottet for Immunitet og reagerer stærkt overfor Stikkene.

Lidt efter lidt tillægger Kvæget sig en vis Immunitet, samtidig med at Sværmene bliver mindre. Hunnerne har nu faaet Blod nok og har travlt med Æglægning, men jeg har alligevel konstateret Simulier i Heste, Kvier og Faar's Øren baade i Juni, Juli og August, uden at disse Angreb førte til dødelig Udgang.

Vi kan altsaa gaa ud fra, at Faren for og Dødeligheden blandt Kvæget er størst i Mai Maaned og betinges af de sværmende Hunners Talrighed, af Vindforhold og Temperatur — særlig i Aadalene og tilgrænsende kratbevoksede Egne, der byder Læ for Sværmene.

Mindre Angreb kan irritere Dyrene, men ikke dræbe dem.

Om Simulium-Angreb paa Mennesker høres sjældent noget herhjemme; i Reglen er det kun med lettere, forbigaaende Symptomer. Jeg kender kun ét Tilfælde, som maatte kaldes alvorligt. Det hændte ude i Egnen omkring Lilleaa ved Laurberg, hvor to unge Piger blev angrebet og maatte paa Hospitalet en 14 Dages Tid.

Angrebene er ikke lige ødelæggende hvert Foraar, og det kolde regnfulde Vejr i 1920 med kun faa Dages høj Temperatur gav heller ikke mange Dødsfald. Ogsaa Aaret 1921 forløb roligt trods umaadelig Tørke og Varme, medens Foraaret 1924 var et svært Aar for vore Dyr i Gudenaa—Nørreaadalene, og store Værdier gik til Grunde.

Jeg formaar ikke at give nogen Forklaring paa denne Periodicitet. Kun vil jeg bemærke, at en lignende periodisk Optræden er ofte iagttaget hos andre Insekter.

Hvorledes kan Simulium-Plagen bedst bekæmpes?

At komme Myggene til Livs i Imago-Stadiet, er ugørligt; der kan maaske være Tale om at indskrænke Ægs, Larvers og Puppers Antal paa visse Omraader i vore rindende Vande — specielt i de mindre Bække.

For Gudenaaens Vedkommende vilde et saadant Arbejde næppe kunne overkommes; thi flere af Simulium-Lokaliteterne er beliggende i de større flodlignende Partier af Aaen.

Man kunde fjerne store Dele af den submerse Vegetation For- og Midtsommer, og derved berøve Simulierne Lejlighed til videre Æglægning og Udvikling — altsaa indskrænke Antal og Generationer. Denne Fremgangsmaade er egentlig den eneste Mulighed m. H. t. direkte Bekæmpelse af Æg, Larver og Pupper. Jeg anser den imidlertid ikke for effektiv. Derimod har jeg mere Tro til, at man ad andre Veje — om jeg saa maa sige indirekte — bedre kunde holde Plagen nede, ved gennem praktiske Circulærer at forklare Landmændene, hvorledes de skal forholde sig i April og Mai paa de Lokaliteter, der er mest udsat for Sværmangreb. Man bør hyppig tilse Dyrene i den kritiske Tid, lade dem blive stukket af Simulierne til en vis Grad (derved erhverves Immunitet), men iøvrigt paa de slemme Dage kun lade dem være ude faa Timer ad Gangen og ikke i den værste Middagshede.

Er Kvæget for stærkt angrebet, og man ser Simulierne bedække Yver, Næse og Øren, og i det hele iagttager Dyrenes lidende Tilstand, bør de saa vidt muligt transporteres hjem paa Stalden, hvor Myggene da snart i Halvmørket forlader dem og søger til Vinduerne eller ud i Lyset.

Yderligere Behandling bliver Dyrlægens Sag.[1])

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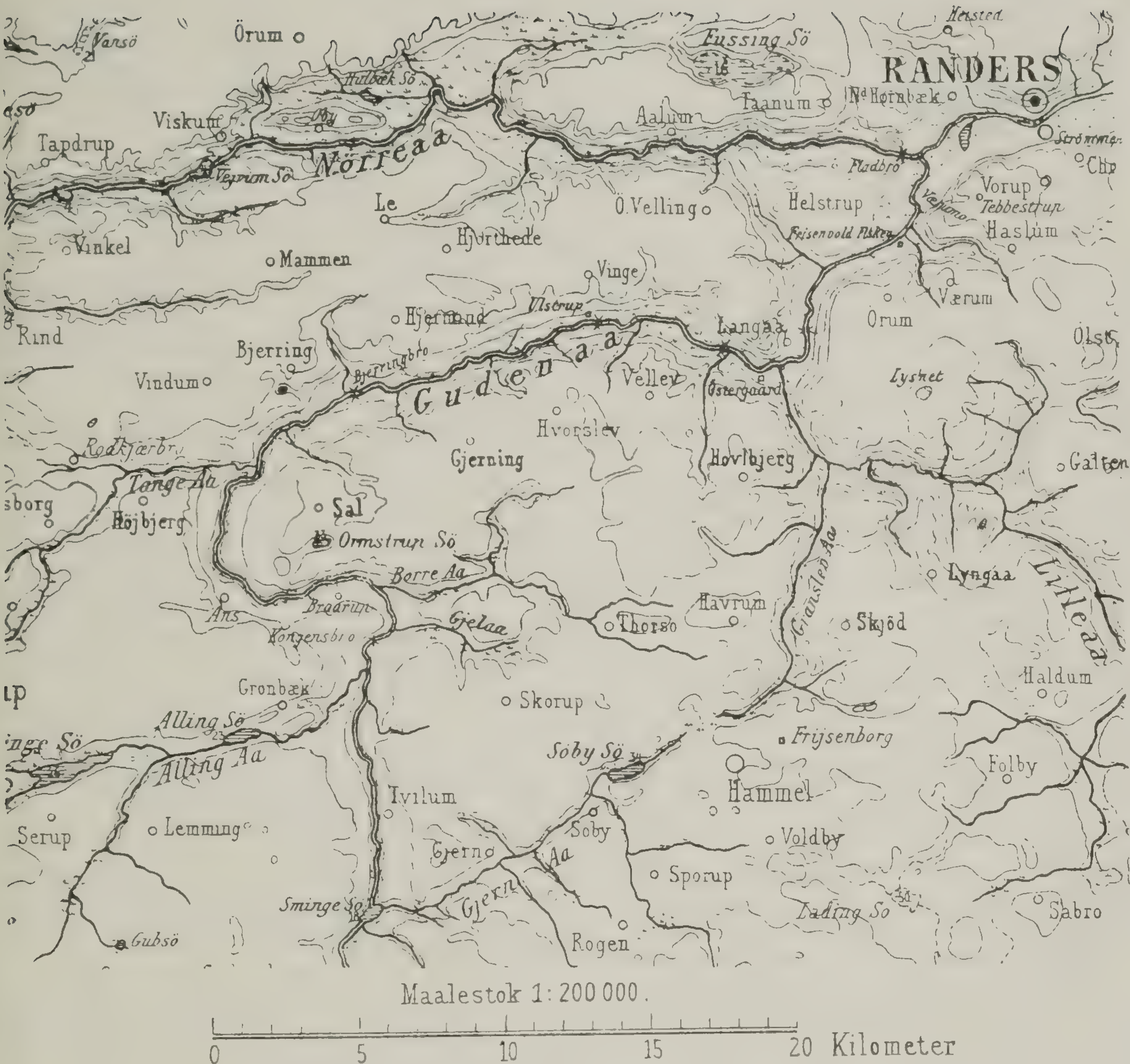
[1]) Efter at dette var gaaet i Trykken, tilføjes: Foraaret 1925 blev et meget mildt Aar m. H. t. Kvægmygangreb.

Jeg havde forudsagt det i vore lokale Blade paa Grundlag af mine biologiske Observationer i Februar og Marts, og det slog til. Kun et Par mindre Angreb viste sig i Gudenaadalens Opland, men disse blev afværget, fordi Landmændene her fulgte mine Forskrifter.



Kortskitse over det undersøgte Vandomraade, der viser netop de Aadale og tilgrænsende Egne af Midt- og Østjylland, hvor de største *Simulium*-Angreb finder Sted.

Kap. III.

English summary.

Although only a limited territory of Jutland has been examined, I am of opinion that the species of Simulium observed can be divided into two biological groups: river-forms and cold-water-forms. The results from Haslum and Rebbild — two localities far distant from each other — seem to confirm this.

The number of generation varies in the different species. Temperature and locality are in that respect important factors.

The river-forms (rivulet-forms): *S. argyreatum*, *S. equinum* and *S. ornatum* are found in several generations in our larger slow-flowing rivulets and brooks; they are at the same time our most dangerous Simulium. The higher the temperature, the shorter the duration of the egg-, larva- and pupa-phases.

But *S. ornatum* is peculiar in also appearing in cold springs and in forest brooks.

It is a transition-form between the rheophile and the limnophile fauna, and while in rivulets and large brooks it is rich in individuals with several generations, and appears dangerous, it is in cold water destitute of individuals and has only one or two generations.

As regards the cold-water-forms: *S. latipes* and *S. costatum*, circumstances are somewhat different. Here we generally find two generations (spring and autumn), sometimes only one generation, but the Imago-stage is certainly of much greater duration than that of the river-forms.

All the Simulium, examined by me, winter in the larva-stage with stagnation of growth during the coldest time.

Several species live in the same water-area, and larvæ and pupæ of two or more species are found mixed with each other on one and the same stone or plant. The eggs of the river-forms are laid on the surface on submerse plants, most frequently on the under side of the leaves — rarely deeper. Also on stalks of grass, from the bank dipping into the running water, eggs can be found.

Most eggs are envelopped in a mass of jelly, which is, however, more or less dense. The egg stage is comparatively short, probably about one week.

The cold-water-forms oviposit on the bottom of the brook under

stones in the bed. These brooks in dry summers have so little water that a great many annimals must die. The Simulium get over such periods, as the eggs can probably stang a temporary drying up. In such cases the resting time of the egg-stage is prolonged.

I have always seen a little dampness under the stones in the bed of the stream, just where I have found eggs of *S. latipes* at midsummer tide. Swarms of Imagines may be found several km from the water, in which they were hatched. The wind is the most important factor in that respect. Copula most frequently take place in the air, is also seen in captivity and sometimes on cattle. Both sexes form swarms, and any rule can therefore hardly be made.

The farmers of this neighbourhood have during these last years undoubtedly learned better how to take care at the critical moment. The actual result of our knowledge is that only one remedy for fighting against the Simulium can be recommended, viz. gradually acquired immunity, which will be obtained if the cattle come out a few hours at a time in April and May, and are exposed to smaller attacks, but under inspection. This of course has not only reference to older, but also to young animals that have never before been exposed to Simulium poisoning. In this way they will soon be capable of recistance and not easily be killed by the poisoning.

(Marts 1925).

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To formodede Bastarder mellem de to grønlandske Ederfuglearter.

ved

Th. N. Krabbe.

(Hertil Tavle XXXVI—XXXVIII.)

Haand i Haand med de betydningsfulde Resultater, som Studiet af Arvelighedslæren i de senere Aar har opnaaet, er selvfølgelig ogsaa gjort betydelige Fremskridt i vor Viden om Bastardernes Biologi, idet Studiet af dette Emne er saa nøje knyttet til det førstnævnte; men det maa her stærkt betones, at den forøgede Kundskab med Hensyn til Bastardernes Biologi dog særlig, for ikke at sige udelukkende, er opnaaet ved Iagttagelse af de „kunstige“ Bastarder, d. v. s. de Bastarder, som skylder Menneskets Indgreb deres Tilblivelse. Her kan Studiet jo nemlig drives rationelt. Her er Bastardens Diagnose fastslaaet i alle Enkeltheder; vi kender begge Forældrene, véd endog, om disse er A ♂ × B ♀ eller A ♀ × B ♂. Alt kan her være kontrolleret.

Ganske anderledes er Forholdet ved de Krydsninger, som de vildtlevende Dyr og Planter byder os, de „naturlige“ Bastarder; her er Diagnosen særdeles ofte yderst vanskelig, og særdeles ofte kan Sikkerhed overhovedet ikke opnaas. Diagnosen Bastard kommer i slige Tilfælde til at bero paa et Skøn, en Tro. Da Genstanden for nærværende Afhandling er to Fugle, kunde det maaske være paa sin Plads at nævne kun et Par løsrevne Eksempler fra Fugleverdenen. Rakkelhanen (Urhane × Tjurhøne) er jo kendt gennem lange Tider. Kjærbølling's „*Anas mergoides*“ (oprindelig bekendt fra Naumann's: „Naturgeschichte der Vögel Deutschlands“, XII. Theil, Leipzig 1844, Pag. 194—197) betragtes nu som utvivlsom *Clangula glaucion* × *Mergus albellus*. Den i E. Lehn Schiöler's „Danmarks Fugle“ I. Bind, Pag. 309 (Afbildning Tavle 59) nævnte Bastard er øjensynlig *Anas boscas* × *Anas acuta;* endogsaa Bryst-

benets Form viste Mellemstilling. Kjærbølling's „*Anas mergoides*" er jo særlig mærkelig derved, at den afgiver et Eksempel paa Slægtsbastardering, som i Overensstemmelse med, hvad man altid maa vente, er langt sjældnere end Arts-, for ikke at tale om Racebastardering. Saaledes er iagttaget adskillige Bastarder, hvor Stamarterne er saa øjensynlige, at de maa ansés for utvivlsomme. Dommen over Bastardens Afstamning er i saadanne Tilfælde baseret paa Karakteren af dens Fjerdragt og Bygning og de Overensstemmelser, som kan paapeges mellem visse Enkeltheder hos Bastarden og de tilsvarende Enkeltheder hos Stamarterne.

Fugleslægten *Somateria* er som bekendt repræsenteret i Grønland ved de to Former *S. mollissima borealis* (almindelig Ederfugl) og *S. spectabilis* (Kongeederfugl). Den første er, som det vil være bekendt, en geografisk Race af Linné's skandinaviske *Som. moll.*, altsaa den, som vi nu i Modsætning til den grønlandske kalder *Som. moll. typica.* Af de to grønlandske *Somat.*-Arter er *moll.* afgjort talrigere og har langt større Udbredning end *spectab.*, som paa en stor Strækning af Grønlands Østkysts sydlige Del kun træffes undtagelsesvis. Paa Grønlands Vestkyst lige fra Kap Farvel og helt op til Upernivik ses begge Arter — dog som nævnt især *S. moll.* — i Mængde, indtil for 10—20 Aar tilbage endog i uhyre Mængde. Her ses i denne Sammenhæng bort fra de to Former *Oedemia perspicillata* (L.) og *Eniconetta stelleri* (Pall.), som kun af de ældre Forfattere regnedes til *Somateria*-Slægten, og som desuden kun rent undtagelsesvis er trufne i Grønland, ligesom det derfor ogsaa her kun lige skal nævnes, at Racen *Somat. moll.* var. *dresseri* i den nyere Tid er truffen én Gang i Grønland. Naar man betænker, at de to almindelige grønlandske Ederfugle *S. moll.* og *S. spect.* har den mest udprægede Tilbøjelighed til at flokke sig sammen, at de to Arter nærmest har samme Størrelse og endelig, at Hunnerne af begge Arter har saare stor indbyrdes Lighed i Fjerdragt, saa vil det forstaas, at Tanken om Mulighed for Krydsning mellem de to Arter altid maatte ligge ret nær.

Som bekendt er *Som. moll. borealis* i Egne vest for Grønland stedfortraadt af Formen *Somat. moll.* var. *v-nigrum*, som af nogle Forfattere — sikkert med Urette — er betragtet som en selvstændig Art, kaldet *Somat. v-nigrum* eller — sprogligt urigtigt — *Somat. v-nigra.* Efter vort nuværende Kendskab til denne Ederfugl

(„Ederfuglen med det sorte V") kan det ikke ret godt bestrides, at den kun tør betragtes som en geografisk Race af *Somat. moll. typica.* Hvad angaar Differentialkendetegnene mellem de i det foregaaende omtalte *Som. moll.*-Racer, nemlig *typica*, *borealis*, *dresseri* og *v-nigrum*, skal jeg her indskrænke mig til at anføre, at Forskellighederne især bestaar i Forskel i Næbets Størrelse, Forskel i Størrelsen og Formen af Vokshuden paa Pandens Side samt den forskellige Udstrækning af det grønne Parti paa Kinden og den nærmeste Del af Nakken, og endelig for Racen *v-nigrum*'s Vedkommende, at den paa Struben har det sorte V, som ellers kun findes hos *Som. spect.*-Hannen, især i dens Pragtdragt. Det tør vel nok siges, at Racen *v-nigrum*, naar det sorte V er kraftigt ad maximum, er den af Racerne, som hævder sig stærkest som en adskilt og karakteristisk Form.

Paa den Tid, da den fremragende ornitologiske Forsker C. Holbøll levede i Grønland (1822—56), var man ikke klar over disse Forhold, og specielt kendte man ikke Formen *Som. moll. v-nigrum*'s lokale Udbredning. Holbøll har neppe vidst noget om denne Form. At han imidlertid er den første Ornitolog, der i Grønland har staaet med et Eksemplar af denne Race i Haanden, vil vist ingen længere betvivle; det vil formentlig fremgaa med utvivsom Sikkerhed af følgende.

I Holbøll's „Ornithologiske Bidrag til den grønlandske Fauna" i „Naturhist. Tidsskrift", 4. Bind 1842—43, siger han Pag. 415:

> „Jeg maa antage, at *S. moll.* undertiden yngler med *S. spect.*, thi ej alene træffes ikke ganske sjældent Hunner, hvis Næb har Lighed med begge Arters, men jeg har endog flere Gange faaet Hanner af *S. molliss.* med den sorte landsejerndannede Tegning paa Halsen, der karakteriserer Hannen af *S. spectab.* Museet er tilstillet et saadant Individ; et andet er for Tiden i min Samling."

Paa Museet vides intet om dette af Holbøll omtalte og afleverede Skind. Det maa i Tidens Løb være gaaet til Grunde eller paa anden Maade forsvundet. Imidlertid kan man, naar alle Forhold tages i Betragtning, ikke tvivle om Fundet og ej heller undlade at finde Holbøll's Forklaring af sit Fund yderst naturlig.

I 1891 udgav A. Hagerup (død 1919) — en af de dygtigste og ivrigste Ornitologer, der i den forholdsvis nyere Tid har besøgt

Grønland, i hvilket hans Ophold desværre kun strakte sig over to Aar og med Ophold kun i Arsukfjorden, hvor H. var Assistent ved Kryolithbrudet Ivigtut, — et Arbejde over Grønlands Fugle: „The Birds of Greenland“ by Andreas T. Hagerup, Translated from the Danish by Frimann B. Arngrimson. Edited by Montague Chamberlain. Boston 1891. Efter heri at have meddelt sine personlige Iagttagelser i Arsukfjorden slutter Hagerup med en Fortegnelse over Grønlands til dette Tidspunkt kendte Fuglearter, hvilken Fortegnelse Udgiveren, Hr. Chamberlain, har forsynet med et stort Antal supplerende og korrigerende Bemærkninger. I Fortegnelsen har Hagerup — Pag. 51 — medtaget *Somat. v-nigra*, idet han gengiver Holbøll's Meddelelser og slutter med Ordene: „They probably were *Som. v-nigra.*“ Hr. Chamberlain har hertil gjort følgende Bemærkning:

„As there is no record of this species having been taken farther to the eastward than Great Slave Lake, the insertion of the name here is open to criticism. In my Opinion Holbøll's supposition has more probability than Mr. Hagerup's. — M. C.“

Naar man betænker, at Chamberlain's Udtalelse ligger 48 Aar senere end Holbøll's, kan man vel nok have Lov til at undre sig lidt over hans Standpunkt.

Da jeg i Sommeren 1891 udgik til min Stilling som Læge i Godthaab, opfordrede Viceinspektør ved vort zool. Museum Herluf Winge (død 1923) mig til at have min Opmærksomhed henvendt paa dette Forhold. Jeg fandt snart efter min Ankomst, at Grønlænderne ved Godthaab og især ved Udstedet Kangek ved Godthaabsfjordens Munding var godt kendte med Varieteten *v-nigrum*, og de lovede mig ret bestemt at kunne levere den, naar Foraarstrækket (i 1892) begyndte. Og ganske rigtigt! Mine Anstrengelser i saa Henseende førte til, at jeg allerede i Sommeren 1892 kunde hjemsende til vort Museum 5 Ekspl. af denne Race, ligesom jeg i de følgende Aar indsamlede ikke mindre end yderligere 21 Ekspl. Den sorte V-formede Tegning paa den hvide Strube fandtes hos disse 26 Individer i alle Styrkegrader lige fra den, som ses hos de kraftigst udfarvede Kongeederfugle-Hanner, og ned til en kun ganske svag mørk Antydning.

At anføre alle Winge's iøvrigt særdeles værdifulde Udtalelser om *Somat. moll.'s* Lokalracer, særligt Racen *v-nigrum*, vilde vist

beslaglægge for megen Plads, hvorfor jeg skal indskrænke mig til i saa Henseende at henvise til nærværende Tidsskrift for Aar 1895, Pag. 63, samt „Meddelelser om Grønland“, 21. Bind, Pag. 95—98. Kun én Ting, som vist tør siges at have særlig Interesse i Forhold til det foreliggende Emne, skal fremhæves, nemlig at Winge i sin ovennævnte Artikel i „Medd. om Grønl.“ bl. a. gør den Betragtning gældende, at der muligvis finder Krydsninger Sted mellem den alm. grønlandske Ederfugl og de Individer af Racen *v-nigrum*, der besøger Grønland vestfra, idet han Pag. 98 siger: „Maaske kommer den (Racen *v-nigrum*) en Gang imellem som Gæst til Grønland, og maaske de grønlandske Ederfugle, der se ud som Mellemformer mellem „*S. v-nigrum*“ og den typiske *S. mollissima*, ere Blandinger af de to Racer“, en Betragtning, som vist er i højeste Grad rammende.

Alt det om Racen *S. moll. v-nigrum* anførte har kun skullet tjene til at vise, at den med vor nuværende Kundskab om den intet oplyser om, hvorvidt Krydsning mellem *Som. moll.* og *Som. spect.* finder Sted.

I „Kongl. svenska vetenskaps-akademiens handlingar“, Bandet 36, Nr. 9 findes en Afhandling: „Bidrag til kännedom om norra polartrakternas däggdjur och fåglar“ af G. Kolthoff. Forf. omtaler her Pag. 60—61 et Fund fra 1885 fra Sydgrønland (Godthaabs Distrikt) bestaaende i en *Somat. moll.*, gammel Fugl, som har Dragt delvis som gammel ♂ og gammel ♀, tillige bærer Spor af *Somat. spect.* ♂ og endelig udmærker sig ved, at „en del fjädrar likna ingendera af dessa fåglars dräkt“. Af den indgaaende Beskrivelse af Dragten, som findes i nævnte Afhandling, skal her særligt nævnes, at Hovedet har „ett bredt långsgående gråaktigt band längs midten af hjässan“ og, at „på strupen finns en svag, men tydlig antydning till den V-formiga svarta fläck, som återfinnes hos *Somat. spectabilis* ♂ och hos *Somat. v-nigrum* ♂“. Kolthoff er efter en nøjagtig Undersøgelse kommen til det Resultat, „at fågeln måste vara en bastard mellan de båda paa Grönland förekommande ejderarterna och möjligen en bastard i andra led, d. v. s. en fågel, som uppkommit därigenom, att en bastard mellan *Somat. spectab.* och *Somat. molliss.* parat sig och alstrat afkomma med den sistnämnda arten. Därtill är fågeln en steril hona, som delvis bär hanens dräkt. Man känner numera, att bastarder mellan tvenne skilda simfågel-

arter kunna fortplanta sig med de arter, från hvilka de härstamma, och dessa båda ejderarter stå onekligen hvarandra så nära, att et sådant förhållande ej synes mig alldeles omöjligt.“

Forf. finder endvidere, at Dragtmomenterne, som peger paa *Somat. spectab.*, „äro alldeles tydliga, men dock så svaga, att en ren bastard mellan de båda arterna borde ha haft mer af praktejdern“. Dette „borde“ kan vel neppe tages for mere end et Skøn.

Vort zoolog. Museum besidder et af daværende Kolonibestyrer Justitsraad R. Müller (død 1917) tilsendt afrevet Hovedskind — saaledes som de paagældende Stykker benyttes til Udsmykning af Randene paa Ederduns-Fugleskindstæpperne — af en tilsyneladende *Som. moll.* ♂ i Pragtdragt, hvilket Hovedskind viser en svag graalig Farve (i St. f. den normale snehvide) imellem Hovedkalottens to kulsorte Partier, hvilke sidste desuden er ret stærkt formindskede i Omfang. Skindet er saa beklippet, at Udstrækningen af den fra Panden midt ned ad Næbryggen gaaende fjerklædte Spids ikke kan bedømmes. Grunden til, at dette Fund nævnes her, er den, at det maaske kunde tænkes en Gang i Fremtiden at faa nogen Betydning ved Bedømmelsen af de to Ederfugle, som er denne Artikels Hovedemne. Forøvrigt er Fundet vist identisk med det af ovennævnte R. Müller i hans Bog: „Vildtet og Jagten i Sydgrønland“, Kbhvn. 1906, Pag. 112, nævnte. Beskrivelsen, om end noget uklar, nævner tydeligt Hovedets ovenomtalte graa Midterparti. Fuglen er i saa Fald fra Holsteinsborg fra Vinteren 1898—99. Skindet viser en tynd, sort V-Tegning paa Struben.

Disse to sidstnævnte Fund samt Holbøll's ovennævnte Bemærkning om formentlig fundne Bastard-Hunner er, saa vidt jeg véd, det eneste i Litteraturen foreliggende om formodet Krydsning mellem de to grønlandske Ederfuglearter, inden jeg var saa heldig at komme i Besiddelse af de to Fugle, som er Hovedgenstandene for nærværende Afhandling.

Det turde maaske være rigtigst her endnu at gøre opmærksom paa, at naar Viceinspektør R. Hørring i sit udmærkede Værk om Fugle i „Danmarks Fauna“ (udg. af Dansk naturhist. Forening) i I. Bind, Pag. 171, siger: „Bastarder mellem Ederfugl og Kongeederfugl ses nu og da i Grønland; særlig Hannerne viser da en Sammenblanding af de to Arters Farver og Tegning“, saa er denne Oplysning ifølge Forf.s Udtalelser til mig selv kun baseret paa de

samme Fund og Litteraturangivelser, som er fremdragne her i denne Afhandling.

Jeg skal derefter gaa over til mit eget Bidrag til dette Spørgsmaal.

Under mit Ophold ved Godthaab blev i Sommeren 1900 fra min Ven Herjulf Jørgensen (død 1911), som da bestyrede Kolonien Holsteinsborg, tilsendt mig en skindlagt Ederfugl, som han havde modtaget friskskudt fra en Grønlænder, som havde skudt Fuglen ved nævnte Koloni d. 10. Jan. samme Aar. Kolonibestyreren havde heldigvis hurtigt set, at Grønlænderen havde Ret i, at Fuglen var stærkt afvigende fra en almindelig Kongeederfugl, som den iøvrigt lignede, saa han var ikke i Tvivl om, at den vilde have Interesse for mig, hvorfor han lod den skindlægge og ved første Postlejlighed var saa venlig at sende den til mig. Dens Fjerdragt var saaledes, at jeg straks ved Synet af den ikke kunde andet end ansé den for at være en Bastard af *Som. moll.* og *Som. spectab.*, en Anskuelse, som tilfulde tiltraadtes af Herluf Winge, da jeg efter min Hjemkomst til Danmark (i 1901) præsenterede ham Skindet. Ved et senere foretaget Gennemsyn af mine fra Grønland hjembragte Ederfugleskind fandt jeg til min store Overraskelse et af en Fugl, skudt ved Narssak (ved Godthaab) d. 28. Febr. 1894, som jeg den Gang, da jeg af en Grønlænder modtog Fuglen, havde bedømt at være en *Som. spectab.*, kun med en fra det almindelige afvigende Fjerdragt. Ved nu at sammenholde den med Fuglen fra Holsteinsborg syntes det mig klart, at den lige som denne ogsaa maatte ansés for at være en Krydsning af de to almindelige grønlandske Ederfuglearter *S. moll.* og *S. spect.*, hvilken Anskuelse Winge ved Besigtigelsen af begge Fuglene ligeledes ganske tiltraadte.

Da de to Skind maatte antages at afgive de eneste hidtil eksisterende Eksempler paa nogenlunde sikkert formodet Bastarddannelse mellem de to nævnte Ederfuglearter, raadede Winge mig kraftigt til at afgive en Redegørelse for deres Historie og Udseende ledsaget af en god Afbildning til nærværende Tidsskrift. Efter at have modtaget velvillig pekuniær Understøttelse til dette Formaal af Carlsbergfondet, sendte jeg begge Skindene — efter for Sikkerheds Skyld at have ladet tage gode fotografiske Billeder af dem — til Kunstmaler H. Grønvold i London. Han fremstillede deres Udseende i en yderst omhyggeligt udført Akvarel, som derpaa af

Dansk Reproduktionsanstalt gengaves i det Trefarvetryk, der sammen med Gengivelsen af de nysnævnte fotografiske Billeder ledsager denne Afhandling. Da den grønne Farve paa Kinden og den nærmeste Del af Nakken ikke paa Trefarvetrykket var kommen til sin fulde Ret, nødvendiggjorde dette, at der ved Haandkolorering — udført af Frk. Albertine Benzon — maatte foretages en mindre Korrektion af samtlige Trefarvetryk. Alt dette strakte sig over lang Tid. Beslaglæggelse af min Tid paa forskellig Maade samt flere Rejser til Grønland m. m. kom yderligere til at bevirke, at jeg først nu faar gjort Alvor af at fremlægge dette lille Arbejde.

Hvorvidt et opdaget Dyr i en hidtil ukendt Skikkelse maa ansés for at være enten: 1) en ny Art eller 2) en velkendt Art kun i en hidtil ukendt Dragt f. Eks. p. G. a. Alder, Køn, Aarstid eller af andre Grunde som Race, Varietet m. m. eller endelig 3) en Bastard mellem to velkendte Arter, det kan selvfølgeligt være meget vanskeligt at afgøre, og mange Fejltagelser paa dette Omraade har faaet Lov til at bestaa gennem lange Tider, inden det lykkedes at komme til Bunds i Sammenhængen. I et Tilfælde som det foreliggende tør det formentlig øjeblikkelig fastslaas, at der ingen Grund er til at beskæftige sig med den første Mulighed: at der skulde foreligge en ny Art. Den arktiske Fugleverden er saa godt kendt, og de to foreliggende Fugle — tilmed indbyrdes ikke éns — har saa stor Lighed med velkendte arktiske Fuglearter, at en saadan Tanke brat maa afvises. Men Spørgsmaalet om, hvorvidt de to Fugle er Bastarder af de to almindelige grønlandske Ederfuglearter, eller de er Individer — kun i en hidtil ukendt Skikkelse — af den ene af disse Arter og i saa Fald formentlig sandsynligst *Somat. spectab.*, dette Spørgsmaal fortjener naturligvis en yderst forsigtig Bedømmelse.

Idet man staar over for disse to mærkelige Fugle i deres formentlig hidtil aldrig sete Skikkelse, vil det straks springe i Øjnene, at de begge nærmest er iklædt Kongeederfuglens udfarvede Handragt, men med Dragtmomenter, som meget stærkt peger hen paa den almindelige Ederfugl i dens udfarvede Handragt, nemlig:

1) Det sorte V paa Struben er, dog kun hos Holsteinsborgfuglen, erstattet med et knapt synligt Spor af V-Tegning.
2) Tilstedeværelsen af et sort Parti over og bag Øjet, som savnes hos den normale Kongeederfugl, i hvert Fald afgjort i et saa-

dant Omfang. Mest fremtrædende er dette hos Godthaabfuglen.

3) Hos begge en Pandeknold, som i Mægtighed ligger midt imellem Kongeederfuglens kraftige og den alm. Ederfugls kun svagt antydede Knold.

4) Udstrækningen af det søgrønne Parti paa Kinden og den nærmeste Del af Nakken, idet dette paa den alm. Ederfugl fortil kun naar frem til Øjet, hos Kongeederfuglen fortil naar frem til Sidefjerbedets forreste Spids ved Næbroden, medens det hos begge de to omspurgte Fugle fortil standser omtrent midtvejs.

5) Skulderfjerene og de seglkrummede Armsvingfjer, som hos den alm. Ederfugl er snehvide, hos Kongeederfuglen kulsorte, præsenterer sig hos begge de omspurgte Fugle med samme stengraa Farve som paa Hovedkalotten, altsaa den mest udprægede optiske Mellemting mellem snehvid og kulsort.

6) Korteste Afstand fra Næsebor til Sidefjerbedets forreste Del er paa Holsteinsborgfuglen 6,5, paa Godthaabfuglen 9,5 mm. Det samme Maal taget paa 10 gamle grønlandske *Som. spect.* ♂♂ svinger mellem 10,0 og 13,0 mm (Gennemsnitsm. 10,9), paa 10 gamle grønl. *S. spect.* ♀♀ mellem 9,0 og 10,5 mm (Gm. 10,1), et Moment, der ligesom Punkt 3 og 4 peger hen paa en Mellemstilling mellem *S. moll.* og *S. spect.* (ret stærkt for Holsteinsborgfuglens Vedkommende).

Hvad angaar de to Fugles øvrige Ydre, er kun at bemærke, at de ud over det ovenfor nævnte ikke i andre Henseender afviger fra en normal *Somat. spectab.* ♂ i udfarvet Dragt, hvilket ogsaa gælder Størrelsen, idet Vingemaalet fra Haandled til Vingespids udgør

hos Holsteinsborgfuglen 276 mm,
hos Godthaabfuglen . . . 281 mm.[1])

Det vil antagelig efter den ovenstaaende detaillerede Beskrivelse forstaas, at Tanken maatte ledes henimod Antagelsen af en Krydsning mellem de to Arter: Almindelig Ederfugl og Kongeederfugl. Saaledes gik det mig, og min Tanke bekræftedes som nævnt af min højtagtede afdøde Lærer Herluf Winge. Men senere er fra anden Kant rejst Tvivl. De seneste Tiders vidtdrevne med Sektion forbundne Undersøgelser af Fugle, med indgaaende Studier af Pneu-

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[1]) Begge Fuglene findes paa vort zool. Museum, til hvilket jeg skænkede dem efter min Hjemkomst fra Grønland.

maticitetsforholdene i visse Knogler (og dermed følgende Aldersbestemmelse) og af Forplantningsorganernes Tilstand, har i høj Grad forøget vor Viden angaaende Fuglenes Biologi og angaaende Tydningen af de mangfoldige Fjerdragter, hvori mange Arter optræder. Der er ved disse Undersøgelser opnaaet Resultater, der bl. a. kaster Lys over et Forhold, som utvivlsomt har stor Betydning overfor Forstaaelsen af de to omspurgte Fugle, nemlig den Indflydelse, som Uregelmæssigheder i Udviklingen af Kønsorganerne kan øve paa Fuglens Ydre, paa dens Fjerdragt. Det er ikke min Opgave her at gaa nærmere ind paa disse Forhold, saa meget mindre som de er belyste ved adskillige Eksempler allerede i det udkomne I. Bind af E. Lehn Schiöler's store Værk om Danmarks Fugle. Jeg skal indskrænke mig til at minde om, at det som bekendt forlængst er godtgjort — ogsaa udenfor Fugleverdenen —, at unormale Forhold i Forplantningsorganerne hos et Individ kan bibringe dette Egenskaber i saavel legemlig som sjælelig Henseende, der gaar i Retning af Egenskaber, som normalt karakteriserer det Køn, der er modsat det paagældende unormale Individs. Saaledes har Lehn Schiöler i sin store Samling vist mig en *Somat. molliss.* i afgjort Han-Dragt, som imidlertid ved Sektion har vist sig at være en ♀ med begge Æggestokke uudviklede. Virkninger af Kastrationer udførte paa mandlige Individer baade blandt Mennesker og Dyr har jo været kendt fra de ældste Tider, ligesom det tør forudsættes bekendt, at den nyeste Tids Undersøgelser over den generelle Virkning paa Organismen, som foraarsages af abnorme Tilstande i Genitalorganerne, hvad enten de er af patologisk, traumatisk eller eksperimentel Aarsag, har beredt meget store Overraskelser.

Naar derfor Lehn Schiöler overfor mig har udtalt som sin Opfattelse, at han er mest tilbøjelig til at tro, at mine to Ederfugle slet ikke er Bastarder, men derimod Hun-Kongeederfugle med abnorme Genitalia, saa vover jeg ikke at bestride, at han muligt kan have Ret i en saadan Opfattelse. (Skudlæsioner hos vildtlevendc Dyr kunde maaske nu og da fremkalde slige Fænomener?). Jeg maa naturligvis dybt beklage, at der for ingen af mine to Ederfugles Vedkommende foreligger ved Sektion fastslaaet Kønsbestemmelse. For Godthaabfuglens Vedkommende kunde jeg, hvis jeg den Gang havde set klart paa Forholdet, have skaffet mig denne værdifulde Vished, idet jeg nemlig modtog Fuglen friskskudt. Hvad

angaar Holsteinsborgfuglen, som ved den nærmest totale Mangel af sort V-Tegning paa Struben peger mest hen paa Krydsning, var jeg lovlig undskyldt, idet jeg jo modtog den som Skind.

Det kan muligvis have en om end lidt fjern Interesse at gøre opmærksom paa, at paa Hannen af den vestligere forekommende ikke saa fjerntstaaende Form *Arctonetta fischeri* viser de mørke Partier paa den bageste Del af Ryg samt Bryst og Bug en mørkegraalig Farve, der i ikke ringe Grad nærmer sig til Skulder- og Armsvingfjerenes Farve paa mine to Fugle. En og anden vil maaske heri se et svagt Fingerpeg i Retning af et muligt Naturtilbageslag. Jeg har hørt en saadan Tanke udtalt og gengiver den med alt Forbehold.

Fremtiden maa nu afgøre, hvorledes Dommen over disse to ejendommelige Ederfugle vil falde. Muligheden for Krydsning mellem *Som. moll.* og *Som. spect.* maa ifølge deres geografiske Udbredning og Levemaade forekomme meget stor. Og det turde være uimodsigeligt, at normale Hunner af de to Arter ligner hinanden i en saadan Grad, at Bastarder i feminin Fjerdragt kun yderst sjældent vilde blive anholdte som Mærkeligheder. Og dog har som ovennævnt Holbøll ment at se saadanne. Fremskafning paany af saadanne Hunner vilde formentlig i flere Henseender være af ikke ringe Interesse. Absolut Sikkerhed for Krydsning kan jo kun haves, hvor Forholdene har været af en saadan Beskaffenhed, at enhver anden Forklaring absolut er udelukket; det kunde jo næsten kun ske ved kunstig Etablering af en saadan Situation. Det vil neppe blive forsøgt i en overskuelig Fremtid, da Forsøget vil være forbundet med ikke ringe Vanskelighed, og da Udsigterne til et Resultat vist tør siges at være noget usikre, og det saa meget mere, som saavel de gamle Fugles som det eventuelle Afkoms Levevilkaar i Fangenskab med de uundgaaeligt stærkt forandrede Ernæringsforhold maa forudsættes at kunne gribe saa forstyrrende ind, bl. a. i Fældningsforholdene hos de eventuelt frembragte Bastarder, at disses Værdi som Beviser vilde blive mere eller mindre illusorisk.

Tilbage bliver da antagelig kun at vente taalmodigt, indtil det en Gang ved eventuel Fremskafning af et lignende Individ (fremfor alt særligt som Holsteinsborgfuglen, altsaa saa godt som uden sort V paa Struben) maatte lykkes at faa dette undersøgt i frisk Tilstand. Skulde det da ved Sektion vise sig at være en Han, forekommer det mig, at Diagnosen Bastard vilde være uangribelig indtil

videre. Skulde det derimod — til min store Overraskelse — vise sig at være en Hun med uudviklede Genitalia, kunde jeg i saa Fald alligevel fristes til at nære Betænkelighed ved absolut at forkaste Antagelsen af en Bastard, thi det kunde jo tænkes, at Genitalias Tilstand kunde være en Følge af Bastardtilblivelsen — Sterilitet er jo f. Eks. saa hyppig hos Bastarder —, og at den maskuline og ureglementerede Fjerdragt atter var en sekundær Følge af Abnormiteten. En saadan Mulighed kan neppe forkastes.

Fra Fjerdragterne hos andre Andefugle-Hunner med abnorme Genitalia er hentet Analogier, som skulde tale imod, at de to omspurgte Fugle er Bastarder, men disse Analogier synes mig langtfra tilstrækkeligt overbevisende, og med Hensyn til mine to Ederfugles graa Skulderparti, da forekommer det mig afgjort mest logisk i dette at se et kraftigt Sandsynlighedsbevis for, at Fuglene er Bastarder, og at de er Hanner, idet nemlig Farveændringen paa begge Dyrenes hele Fjerdragt (fraregnet Hovedet) udelukkende har holdt sig til Skulderpartiet, som jo netop paa de to Arter *Som. moll.* og *Som. spect.* udgør næsten det eneste, i hvert Fald det mest fremtrædende Fjerparti (fraregnet Hovedet), i hvilket de to Arters udfarvede Hanner adskiller sig fra hinanden. Skulde det dreje sig om en abnorm Afblegning hos en *Som. spect.* ♂ eller en abnorm Pigmentering hos en *Som. moll.* ♂, skulde det, forekommer det mig, dog være mærkeligt, om denne skulde holde sig n e t o p k u n til dette ene Fjerparti. Jeg kunde i saa Fald næsten fristes til at kalde det et lovligt ondskabsfuldt Naturlune.

Naar saaledes alt tages i Betragtning — og jeg lægger Hovedvægten paa de graa Skulder- og seglkrummede Armsvingfjer hos de to omhandlede Ederfugle — kan min personlige Opfattelse kun konkludere deri, at jeg indtil videre nærmest føler mig overbevist om, at disse to Fugle begge er Hanner, og at de begge er Bastarder mellem *Somat. mollis.* og *Somat. spectab.* Særligt paa Holsteinsborgfuglen støtter jeg mit Standpunkt.

Den højtærede Direktion for Carlsbergfondet bedes modtage min ærbødige Tak for den økonomiske Hjælp til Dækning af Udgifterne ved Tilvejebringelsen af de Afhandlingen ledsagende tre Tavler. Ligeledes har jeg — foruden overfor afdøde Viceinspektør Herluf Winge — overfor d'Hrr. Prof. Ad. Jensen, Viceinspektør R. Hørring og ornitol. Forfatter E. Lehn Schiöler at udtale min bedste Tak for særdeles nyttige Raad m. H. t. det foreliggende Arbejde.

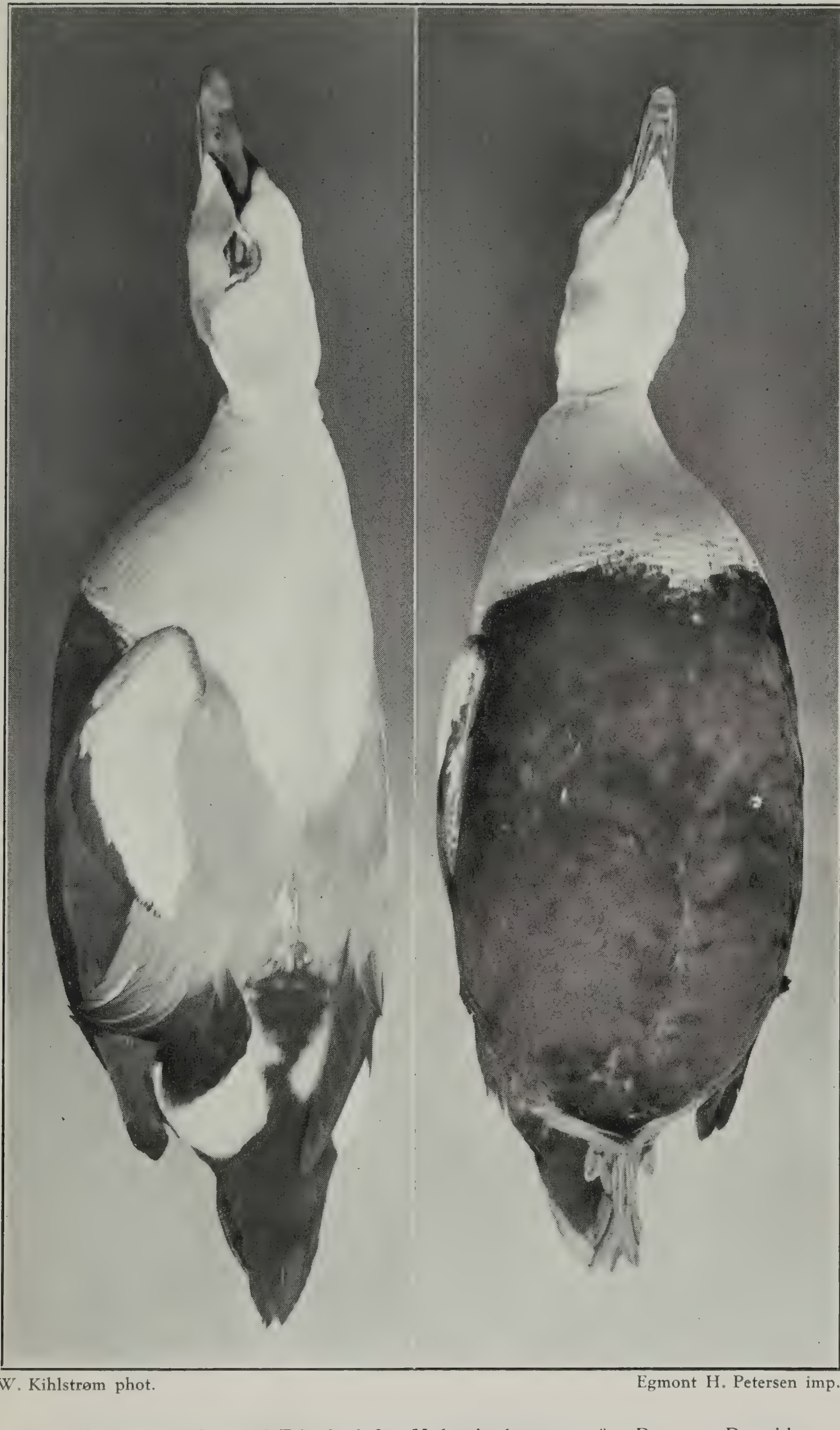
Forklaring til Tavlerne.

Tavle XXXVI. Den formodede Bastard-Ederfugl fra Holsteinsborg set fra Ryg- og Bugside.

Tavle XXXVII. Den formodede Bastard-Ederfugl fra Godthaab set fra Ryg- og Bugside.

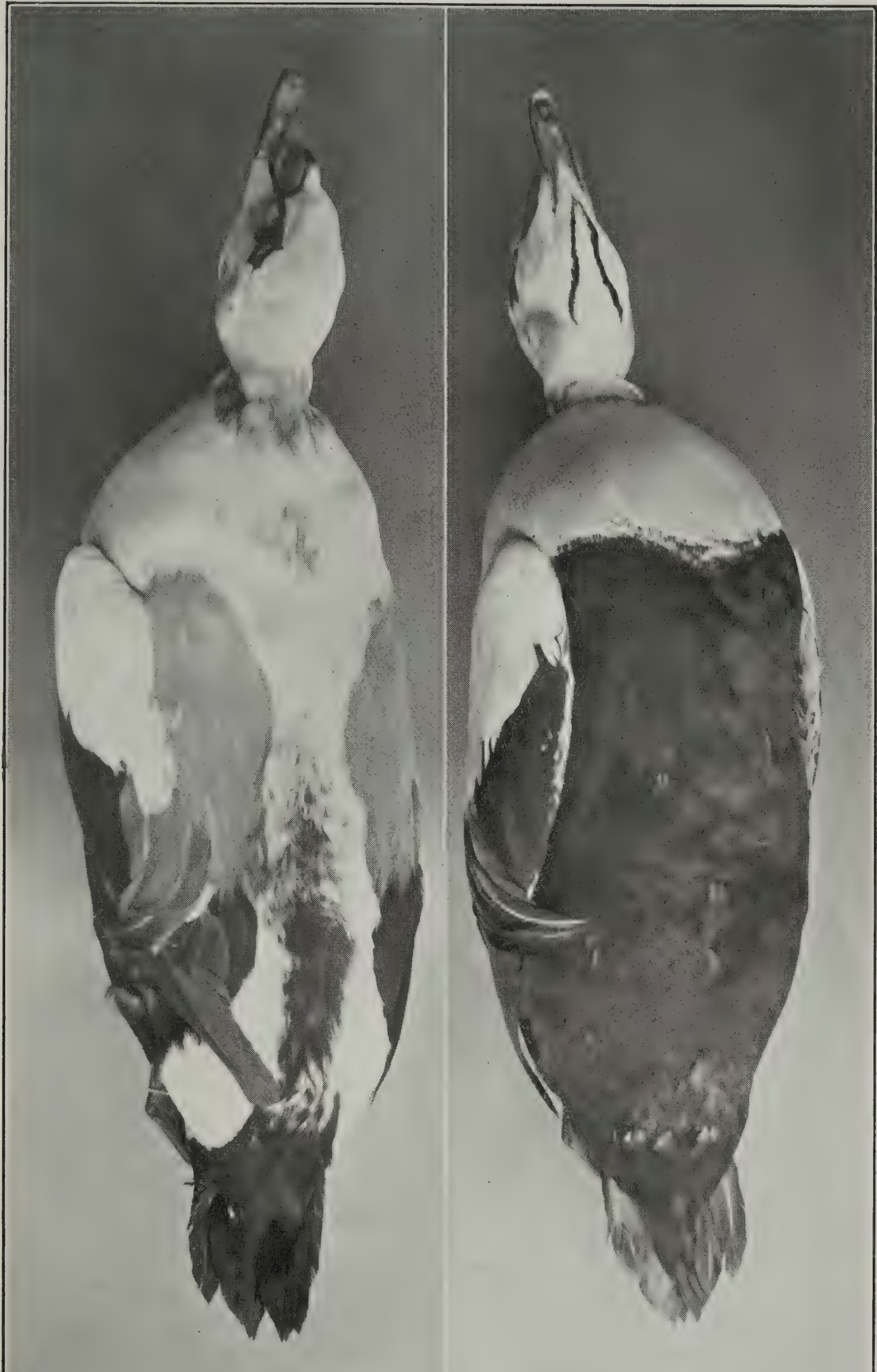
Tavle XXXVIII. De to formodede Bastard-Ederfugle, Fuglen fra Holsteinsborg i staaende, Fuglen fra Godthaab i liggende Stilling. Bagved den sidstnævnte en *Somateria spectabilis* ♂ i staaende Stilling. Mellem de to formodede Bastard-Ederfugle en svømmende *Somat. moll. v-nigrum.* Længere i Baggrunden et *Somateria mollissima*-Par, ♂ og ♀, svømmende.

Det bemærkes, at den røde Farve paa Fødderne af de tre førstnævnte Fugle sikkert fremtræder noget stærkere paa Billedet end paa de friskskudte Fugle.



W. Kihlstrøm phot. Egmont H. Petersen imp.

Den formodede Bastard-Ederfugl fra Holsteinsborg set fra Ryg- og Bugside.



W. Kihlstrøm phot. Egmont H. Petersen imp.

Den formodede Bastard-Ederfugl fra Godthaab set fra Ryg- og Bugside.

De to formodede Bastard-Ederfugle i Forgrunden.
(Se iøvrigt Forklaringen til Tavlerne).

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Ottende Aartis sjette Aargang. II.

København
I Kommission hos C. A. Reitzel.
1925.

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